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# Arno Peters and "his" equal area projection. A practical approach in a GIS environment

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**Abstract**:

**The "Peters" map/historical frame**

In 1973 a misunderstood German historian, Arno Peters, held a press conference in Bonn, at that time the capital of West Germany. He presented to an audience of journalists: "the greatest single advance in map making in over 400 years" (Barney, 2014). It was about an equal-area map of his own design, the best alternative to the Eurocentric Mercator map. The last one showed a misleading image of the world, especially concerning the non-white population lands (Brotton, 2013). A year after the Bonn conference it was the turn of the German Cartographic Society. In the 1974 Berlin conference Peters presented ten cartographic categories, the essential qualities of a map. (later enumerated in the "New Cartography" book – 1983). He compared his own projection to other eight and, especially, to the Mercator map (Vujakovic, 1989). Not surprisingly, only Peters map possessed all ten qualities while the nearest competitor scored only four out of ten (King and others, 1989). The Berlin conference audience, professional cartographers, immediately reacted with a not favorable attitude (Crampton, 1994). In the following years Peters map had a consistent impact, becoming an international best seller. Peters projection was widely surrounded by controversy in many respects. Maybe the first and most important claim is related to a matter of plagiarism (Loxton, 1985; Sriskandarajah, 2003; Hruby, 2017; Snyder, 1994; Barney, 2014; Vujakovic, 1989; Snyder, 1993; Crampton, 1994; Candura et al, 2018).

**The Gall orthographic map**

More than a century before these facts, James Gall, a Scottish clergyman, presented his Orthographic projection, along with other two (Stereographic and Isographic), at the British Association for the Advancement of Science (1855). The Orthographic projection was a modified Lambert cylindrical equal-area, with two standard parallels at 45°, North and South. This Gall map is exactly the same of the one Peters claimed as his own in 1973. In 1855, Gall declared that he did not want any copyright but only asked for his name to be quoted every time the map was used. Therefore, it is quite funny that, even today, Peters map is being sold by ODT Maps and that ESRI writes in its FAQ: "The Peters Projection is not supported. ArcGIS only supports map projections that don't require a license". As you can imagine, this case is a lot more complicated and should be deepened from a legal point of view. Monmonier recently was involved in cartographic projections and patents (2017 and 2018). He quotes 21 patented map projections from 1876 to 1987 but does not mention Peters projection.

**Building the Gall-Peters map in a GIS environment**

Currently, not as many software are able to draw and/or transform global maps into the Gall-Peters projection. Among these, we can quote Flex Projector (FP) and G.Projector.

FP is a free, open source, cross-platform and Java-based software application, which allows the user to draw and transform CRS (Coordinate Reference System) of small scale world maps. It is well suited for cylindrical and pseudocylindrical projections and also polyconical projections with curved parallels (Jenny and others, 2008). The main goal of FP is however to give map makers the opportunity to build new projections, adjusting the ones stored in the embedded PROJ4 library. The Gall-Peters (GP) projection is therefore implemented in FP and so, using this tool, is possible to draw GP world maps and transform them from/to other CRS.

G.Projector is a tool for exploring maps, a Java based cross platform application that can transform an input map image into about 200 global and regional map projections. It was developed by NASA Goddard Institute for Space studies and is freely available at https://www.giss.nasa.gov/tools/gprojector/ . As opposed to FP, the NASA application cannot export vector layers but only raster ones, although in various formats (PNG, TIF, etc.). Using G.Projector, it is possible to derive a GP world map starting from the Lambert cylindrical equal area projection and adjusting the standard parallel to 45° ($\phi_{ts}$=45°). Fig. 1 shows this process and the resulting world map.


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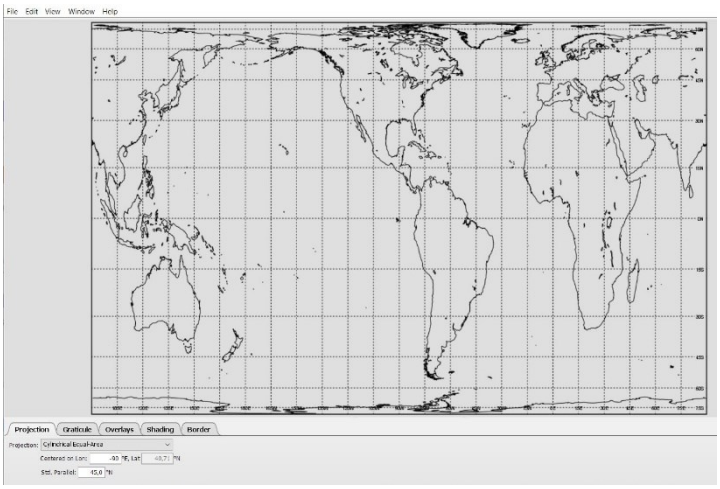


As you can see from the lower tabs, we started from a cylindrical equal-area world map and then we changed both the central meridian and the standard parallel.

Figure 1. The Gall-Peters projection, drawn by G.Projector NASA application and following the software instructions for the GP/Gall Orthographic projection ("See Cylindrical Equal-Area and apply ϕts=45°").

Alternatively, we can directly use PROJ, the generic coordinate transformation software that can be used inside a GIS application. PROJ is in fact implemented into several currently available GIS software. It is possible to transform map layer coordinates using a command string, written in the PROJ syntax.

For instance, in the QGIS environment is possible to draw a world map in the GP projection, using the "+proj=cea" command and specifying the following parameters:

- The longitude center of the projection (90° W in the GP case)
- The latitude of the standard parallels (45° N/S in the GP case))
- The false easting and northing values (0 in the GP case)
- The ellipsoid (or the sphere radius).

In Fig. 2 you can see a GP world map that was built in QGIS after creating a custom CRS (as in ArcMap case, also in QGIS GP CRS is missing). The custom CRS is based on WGS84 Datum, with the Gall-Peters projection (it is the Lambert Cylindrical equal-area projection with the standard parallels at 45°, North and South).

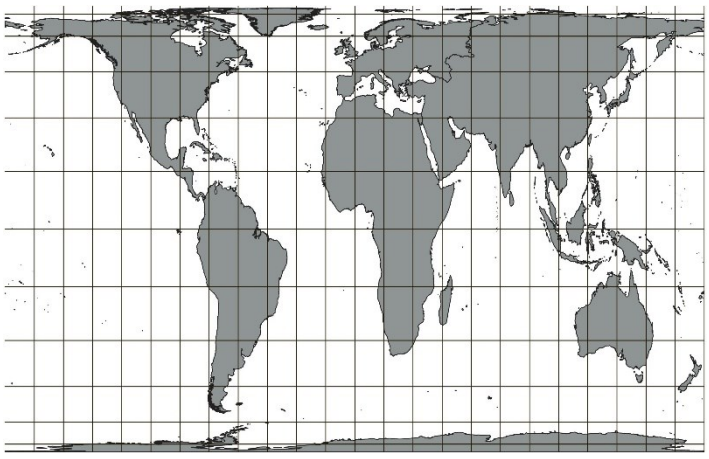

Figure 2. World map in the GP projection, built with the ""+proj=cea" command. The standard parallels are at latitude 45° (North and South). Software QGIS.

**Conclusions**.

The several critics to the Arno Peters projection claim of originality and the unclear situation concerning copyrights still made cartographers to be a little reluctant to use GP projection for mapping at a global scale. In fact, it is uncommon to find thematic maps registered in this CRS. This unwillingness in using this cartographic representation is also clear when you look for GIS software that can transform vector and raster layers into this projection. Anyway, the ease of construction of a GP digital map using the Lambert cylindrical equal-area algorithm with the required adjustment of parameters, testifies that the mentioned cartographer attitude about GP is not so wrong.

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