a PROJECTION is the complex mathematical method of representing our three dimensional earth in a flat, two dimensional context

MAP projections
A field guide to

ELEMENTS OF A PROJECTION

projection surface is chosen

globe is placed in desired projection position (aspect)

true scale lines - central meridians & standard parallels - are defined

add a mathematical algorithm...

$$x = \lambda\sqrt{1-3\left(\frac{\varphi}{\pi}\right)^2}$$

in order to best flatten the world, a shape with an ideal developable surface - one that does not warp, rip or contract is chosen to create the projection. Common choices are cylinders, cones and planes.

PLANE
{planar; azimuthal}

Polar
touching at either pole

Equatorial
touching along equator

Oblique
touching at another point on globe

CYLINDER

The way the projection surface is positioned in relation to the globe is called the aspect

Normal
touching along latitude

Transverse
touching along longitude

Oblique
touching along any other line

CONE
{conic}

Over top of the globe the cone aligns at a line of latitude determining the standard parallel.

Tangent
placed atop globe

The perpendicular line of longitude becomes the central meridian. The cone is unfurled along the opposite line of longitude to the central meridian.

Secant
cuts through globe surface at 2

EVERY PROJECTION HAS INHERENT DISTORTION. NO PROJECTION CAN PRESERVE SHAPES, AREAS AND EXACT DISTANCES IN TWO DIMENSIONS.

CONFORMAL preserves a local area - relative angles at all points on the map are correct.

EQUAL AREA preserves area compromising on scale, angles and shapes to achieve it.

EQUADISTANT preserves distances between two specific points on the map.

COMPROMISE instead of maintaining true measurements, these projections harmonize the different distortions to create a more balanced appearance.

CYLINDRICAL · CONIC · PSEUDOCYLINDRICAL · PSEUDOCONIC · AZIMUTHAL · PSEUDOAZIMUTHAL · POLYHEDRAL

OVER TIME, MANY TYPES OF MAP PROJECTIONS HAVE BEEN CREATED ALLOWING CARTOGRAPHERS TO CHOOSE THE ONE BEST SUITED TO A PARTICULAR MAP'S PURPOSE. LUCKILY FOR US, MANY OF THEM ARE NOT ONLY USEFUL, BUT BEAUTIFUL, TOO.

MERCATOR

Gerardus Mercator - 1569

MILLER

Osborn Maitland Miller - 1942

GALL STEREOGRAPHIC

James Gall - 1855

ALBERS

Heinrich C. Albers - 1805

LAMBERT

Johann Heinrich Lambert - 1772

ECKERT II

Max Eckert - 1906

ROBINSON

Arthur H. Robinson - 1963

MOLLWEIDE

Karl Brandan Mollweide - 1805

CRASTER PARABOLIC

John Craster - 1929

'WORLD FROM SPACE' ORTHOGRAPHIC

As far back as Hipparchus - 2nd century B.C.E

SOUTH POLE ORTHOGRAPHIC

– 16th Century - Albrecht Dürer

NORTH POLE ORTHOGRAPHIC

– 16th Century - Albrecht Dürer

WINKEL TRIPEL

Oswald Winkel - 1921

GOODE HOMOLOSINE

John Paul Goode - 1923

LOXIMUTHAL

Karl Siemon - 1966

FULLER

Buckminster Fuller - 1943

BERGHAUS

Heinrich Berghaus - 1879

BONNE

Rigobert Bonne (1727–1795) & Bernardus Sylvanus 1511

VAN DER GRINTEN

Alphons J. van der Grinten - 1904

SOURCES

WHERE EXACTLY MAPS
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