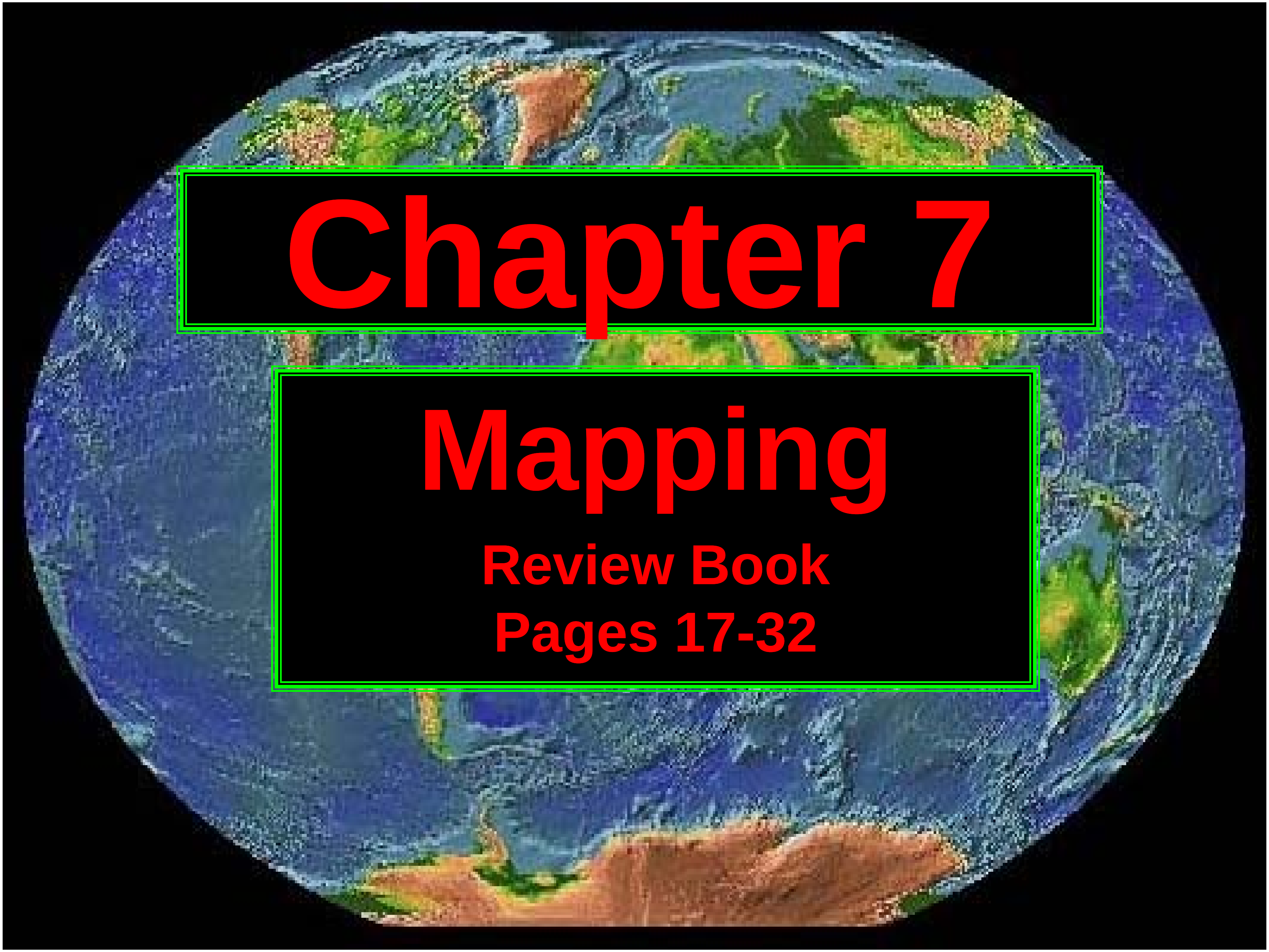
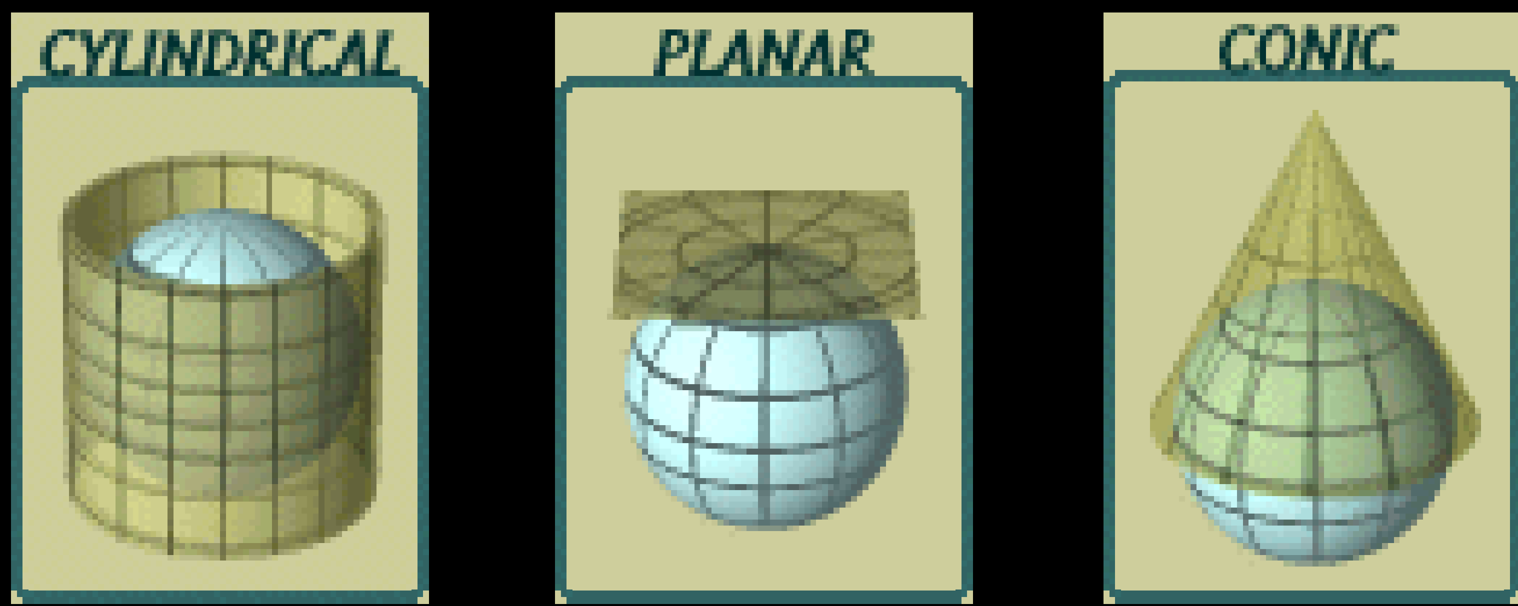
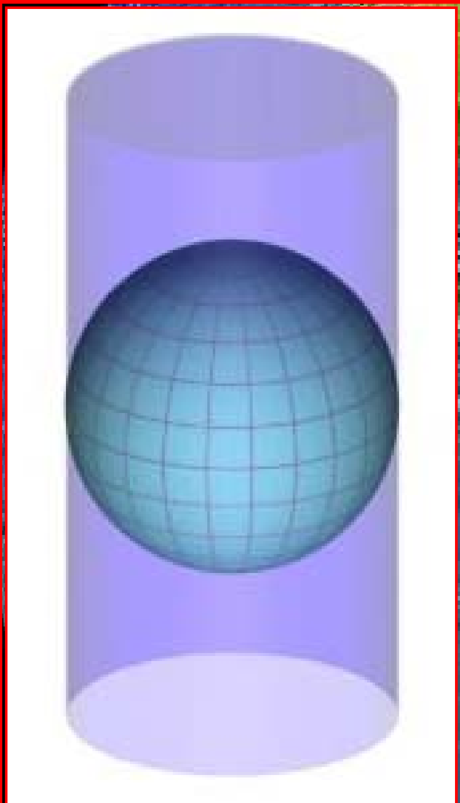

Chapter 7
Mapping
Review Book
Pages 17-32

MAP PROJECTIONS

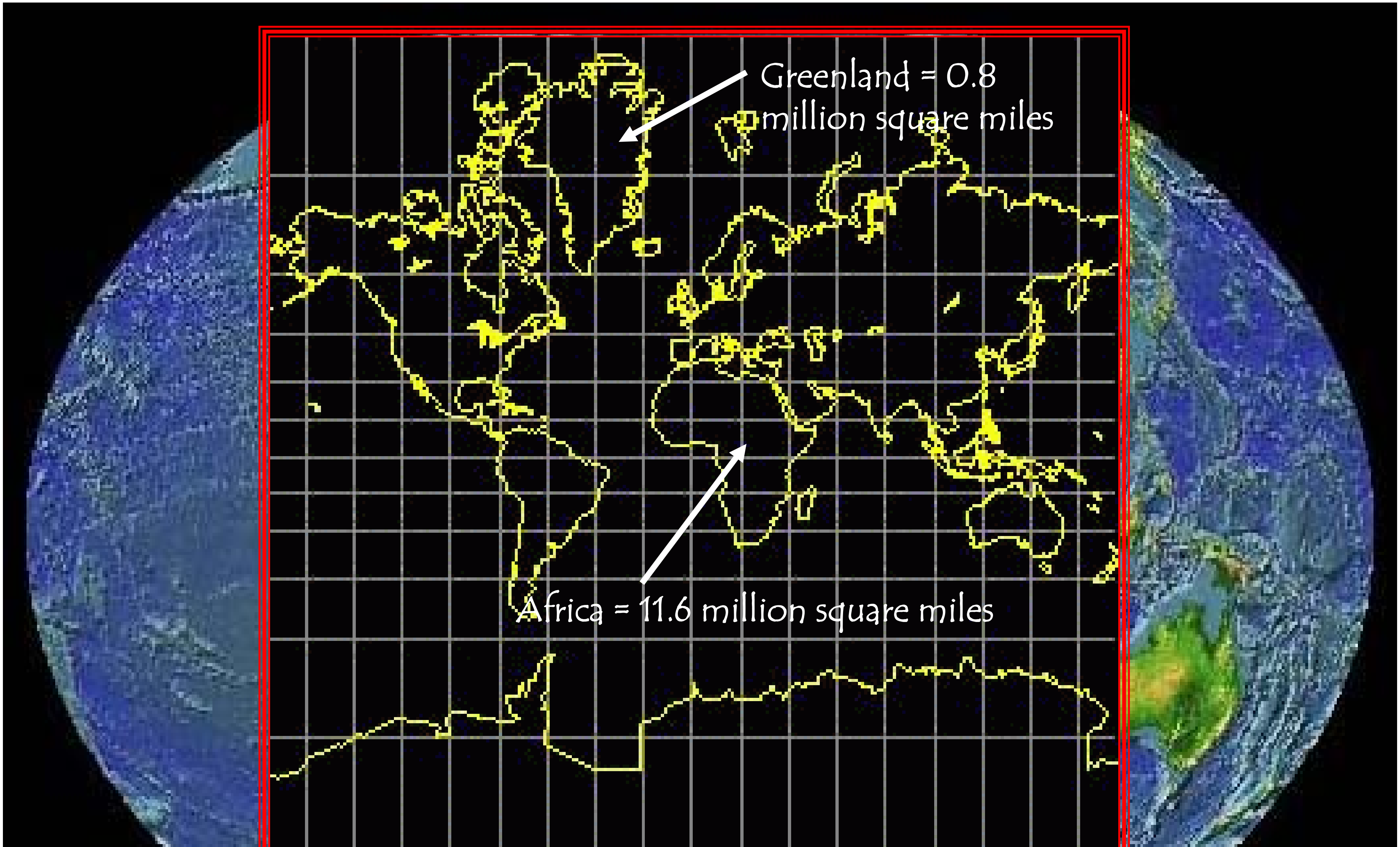
3 Main Types:



Map Projections



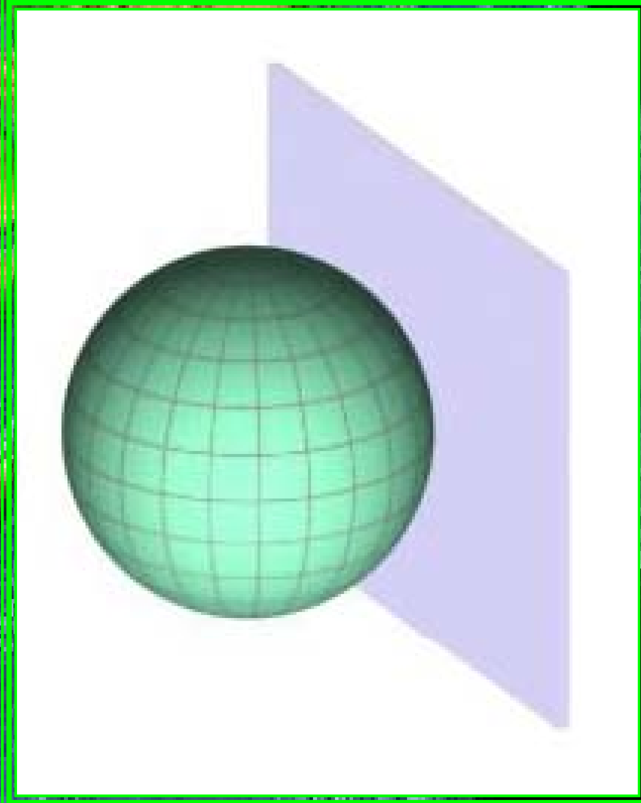
- 1) Mercator – **Made as if a cylinder was placed around the Earth and a light was put on inside the sphere and projected out onto the paper.**
- **Shows the entire world on one continuous map (CYLINDRICAL Projection)**
- **Major problem is that the higher latitudes are very distorted (stretched out)**
- **This is why Greenland appears to be larger than the U.S. on most classroom maps…**



A mercator map shows Greenland & Africa as the same size! Antarctica is also bigger than all the continents put together! This type of map is HIGHLY DISTORTED!

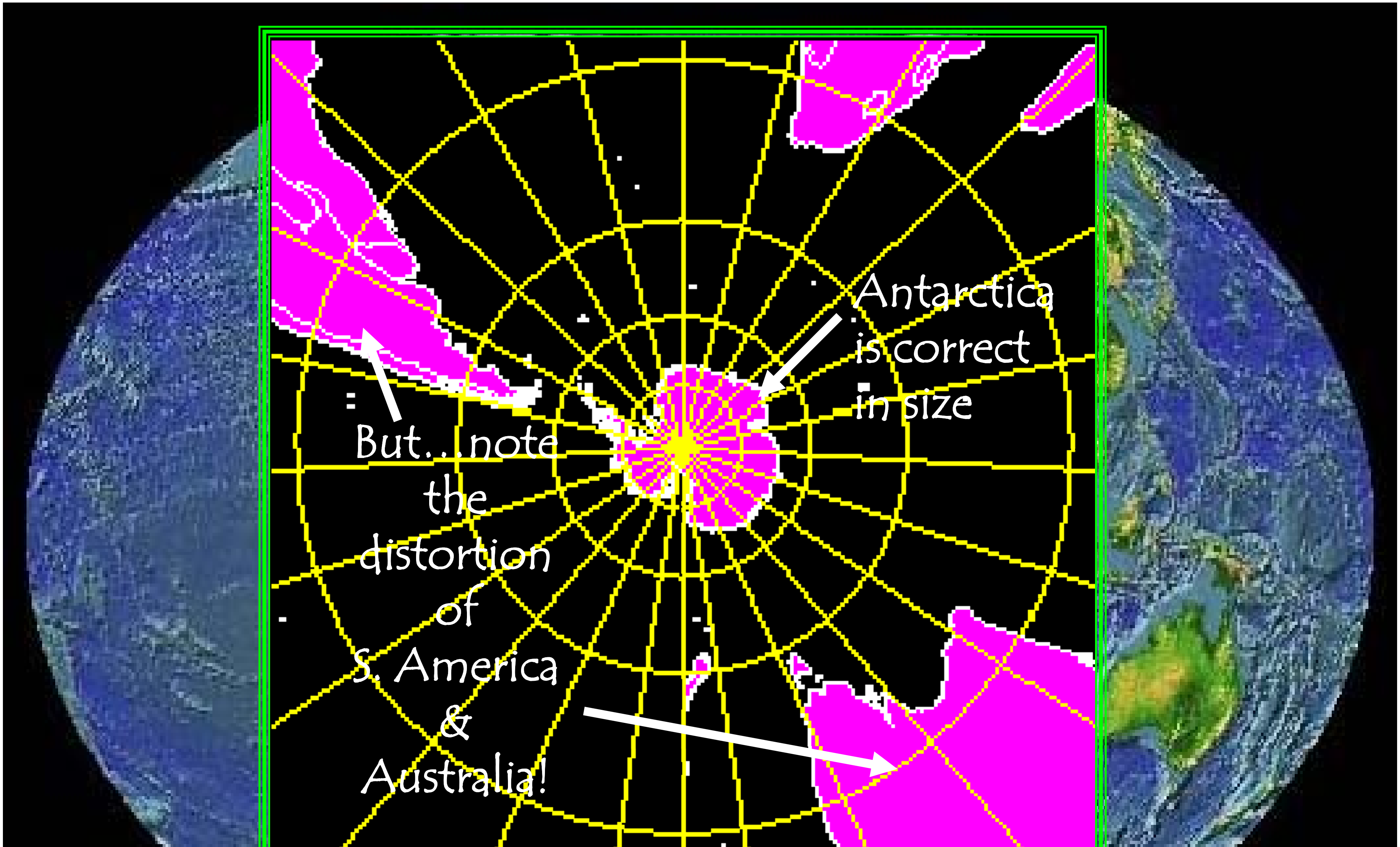
Map Projections

- **Gnomonic - Made as if the Earth's surface was projected onto a square sheet of paper that was only touching one point on Earth's surface. (PLANAR projection)**
- **It can show the shortest route between two points (great circle route), but distances and directions are *distorted*.**

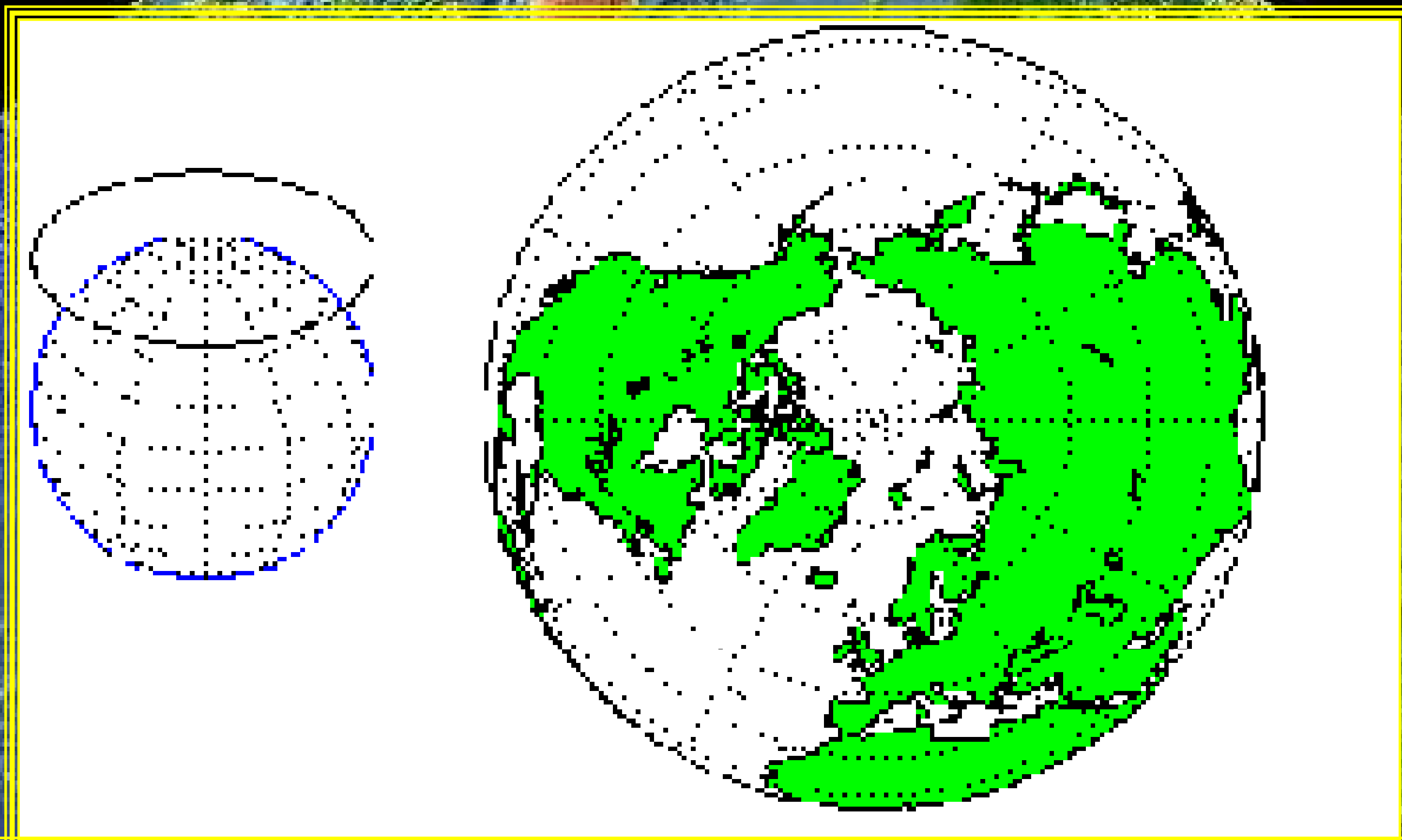


Map Projections

- **Azimuthal** – Also a Planar map projection
- Less distortion than **Gnomonic** due to *curved* map area (not square)
- Distortion also increases further from origin point



Gnomonic projections accurately portray a specific latitude/longitude, but SEVERELY DISTORT as you go farther away from the point of origin!



Note that the Northern Hemisphere Continents are relatively proportional.

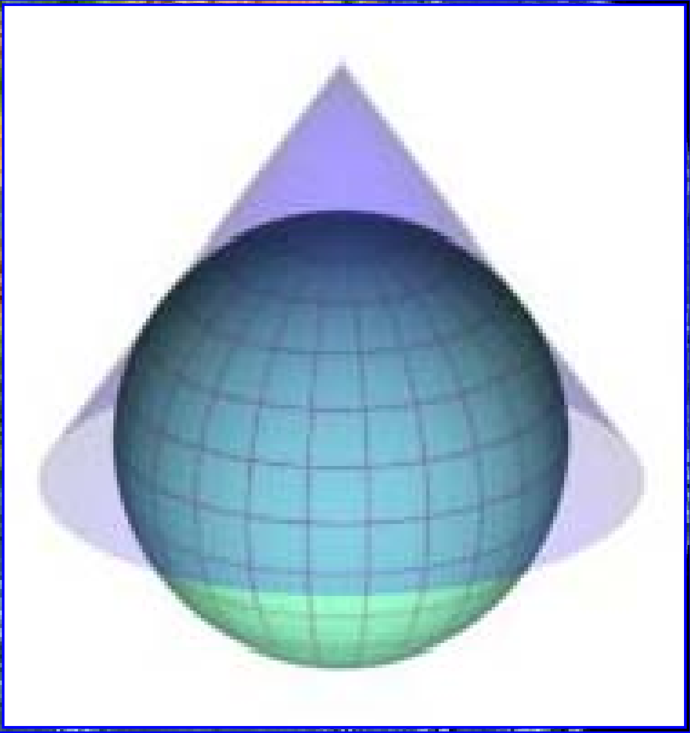
Distortion occurs near the Equator.

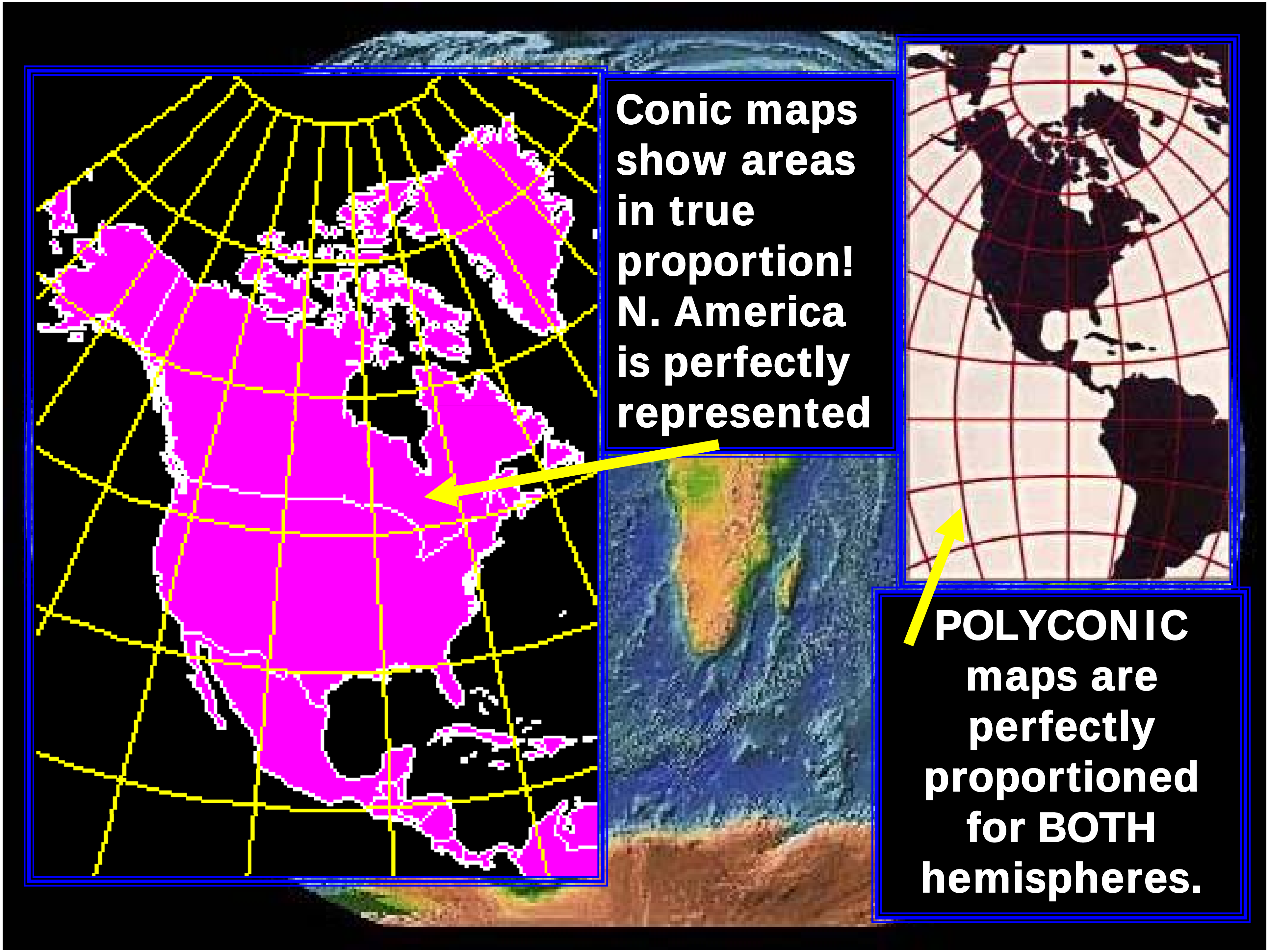
Map Projections

* Conic - used to show small geographic areas. (CONICAL Projection)

* *Nearly* distortion free.

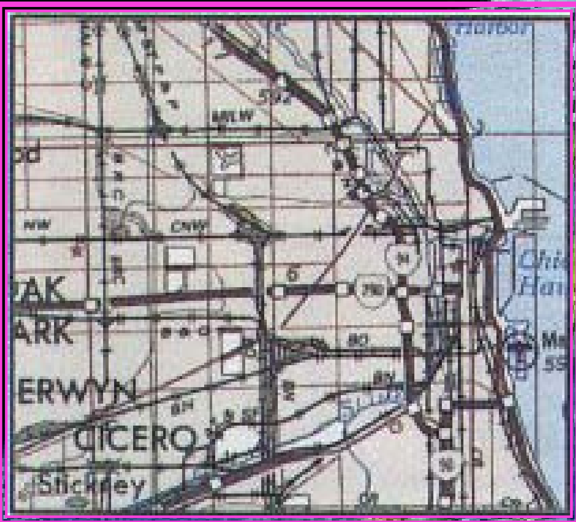
* Used to make topographic maps (our next topic).




Conic maps show areas in true proportion! N. America is perfectly represented
POLYCONIC maps are perfectly proportioned for BOTH hemispheres.

Map Scale

- the distance represented on the map compared to the actual real-life distance
- the ratio of distance on the map to distance on Earth
- Map scales may be represented in three ways:
  - **Verbally**- example: “1 centimeter equals 10 kilometers”.
  - **Graphically**- usually a line divided into equal parts, with each part being a certain unit of length (kilometers, miles, etc.).
  - **Numerically**- usually shown by writing a fraction or ratio to show what part of real distances the map distances are. Example: 1/62500 or 1:62500, which means 1 unit on the map is equal to 62,500 units of real distance.

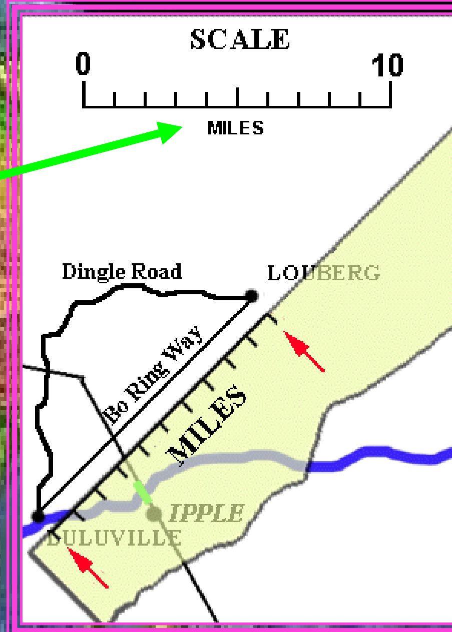


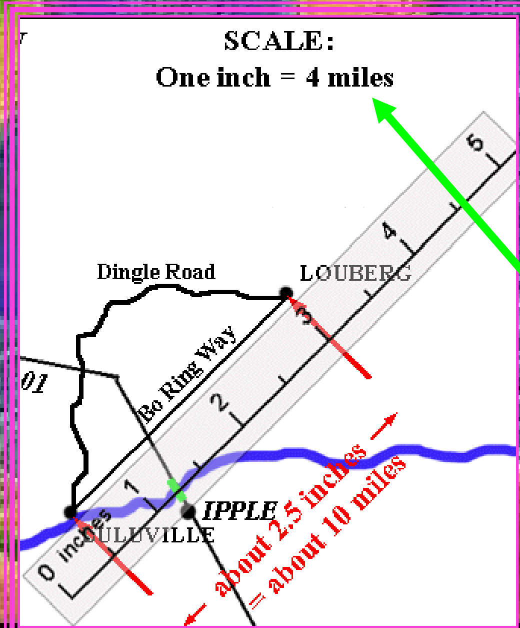
1:250,000 scale (one inch = about 4 miles)

NUMERICAL SCALE

The Bar at the top indicates how long each mile is on the map

GRAPHIC SCALE





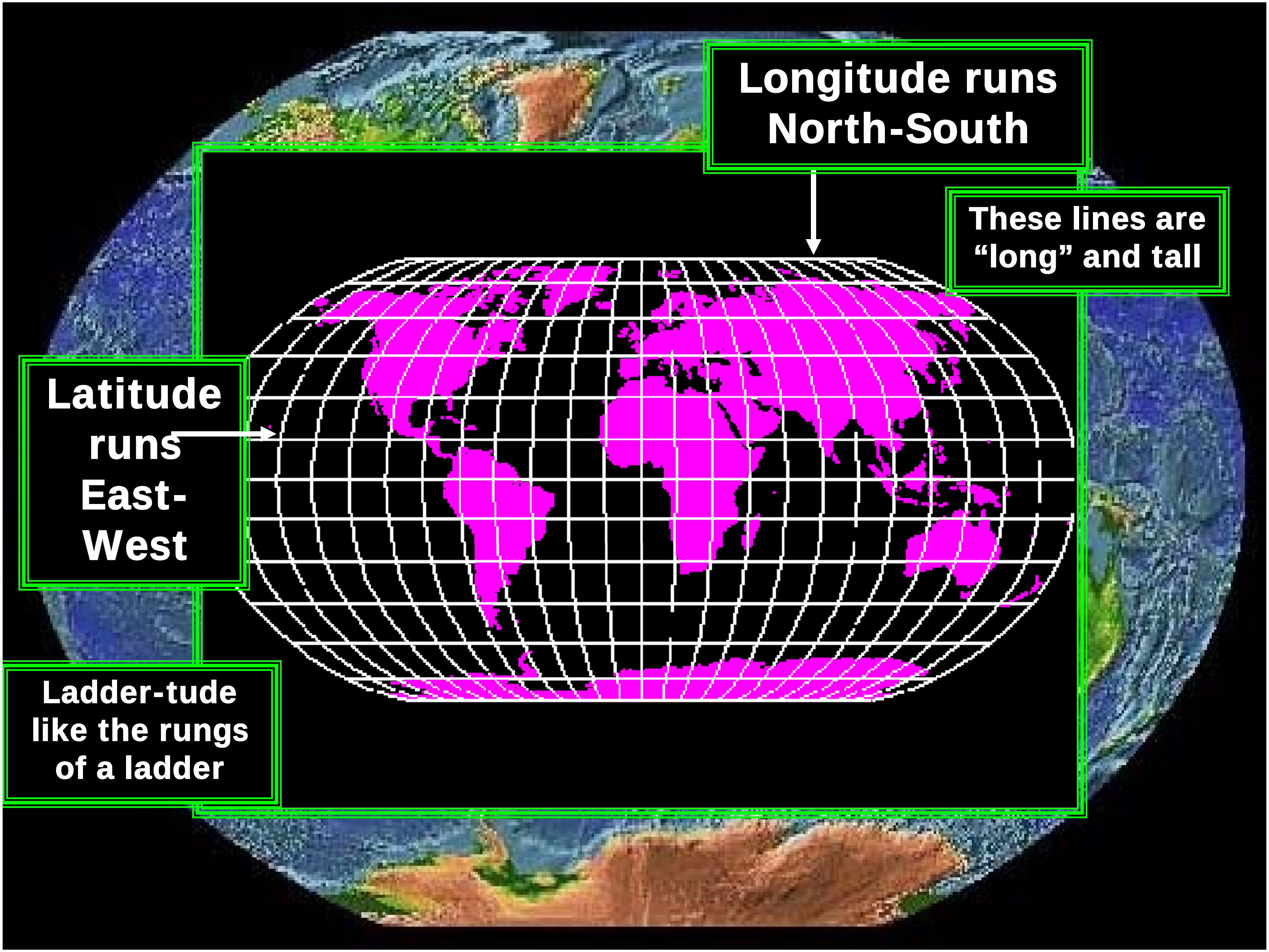
Conversion is written at top

VERBAL SCALE

Latitude and Longitude

- **Latitude** is the distance in degrees (0º - 90º) north and south of the equator (0º).
- Lines of latitude are called **parallels**.
  - imaginary lines that circle the world from east to west parallel to the equator.
- One degree of latitude on land is equal to 111.3 km (69.2 miles).

- **Longitude** is the distance in degrees (0º - 180º) east and west of the prime meridian (0º).
- Lines of longitude are called **meridians**.
  - imaginary lines that form half-circles and run between the North and South Poles.



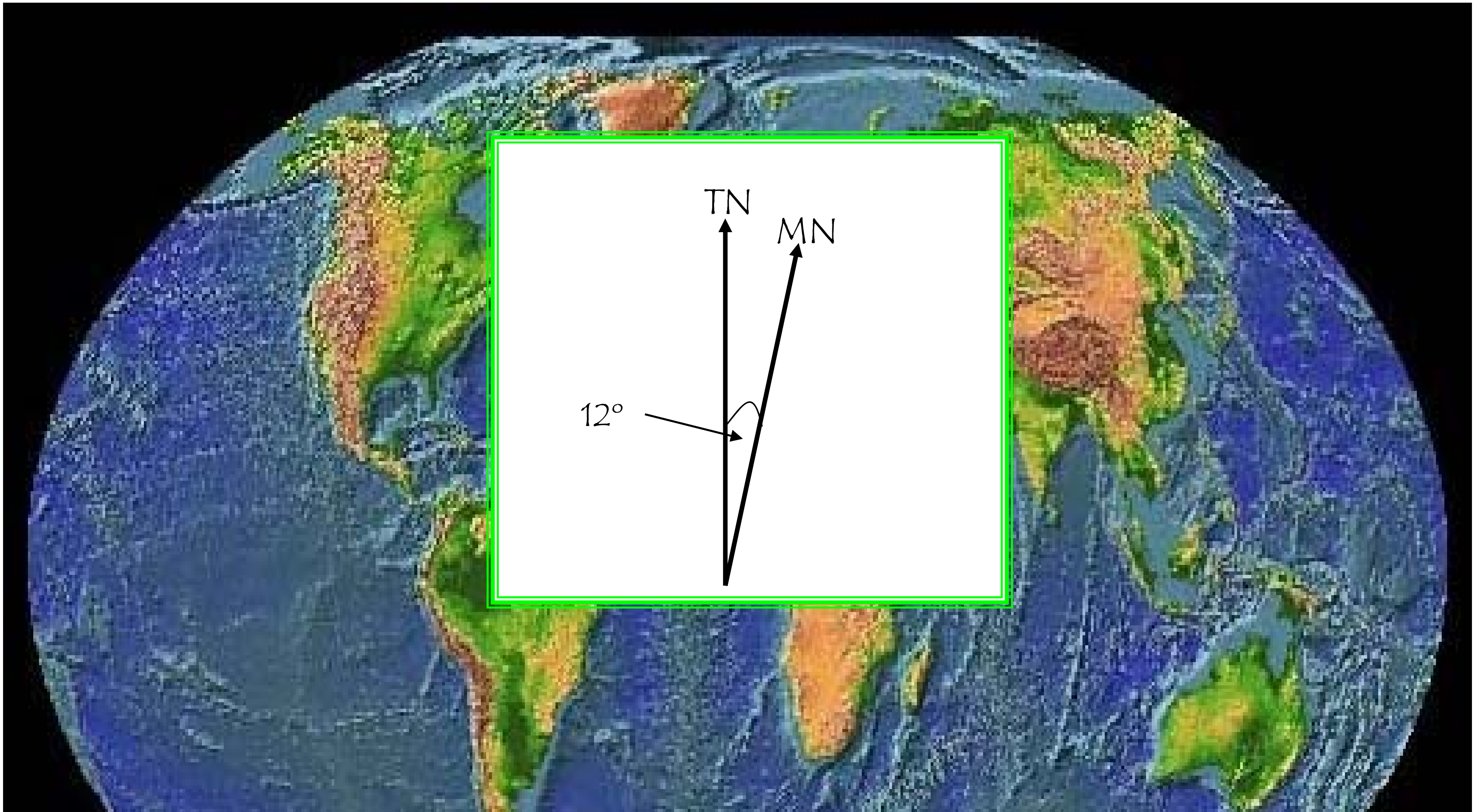
Longitude runs North-South
These lines are "long" and tall
Latitude runs East-West
Ladder-tude like the rungs of a ladder

Magnetic Declination

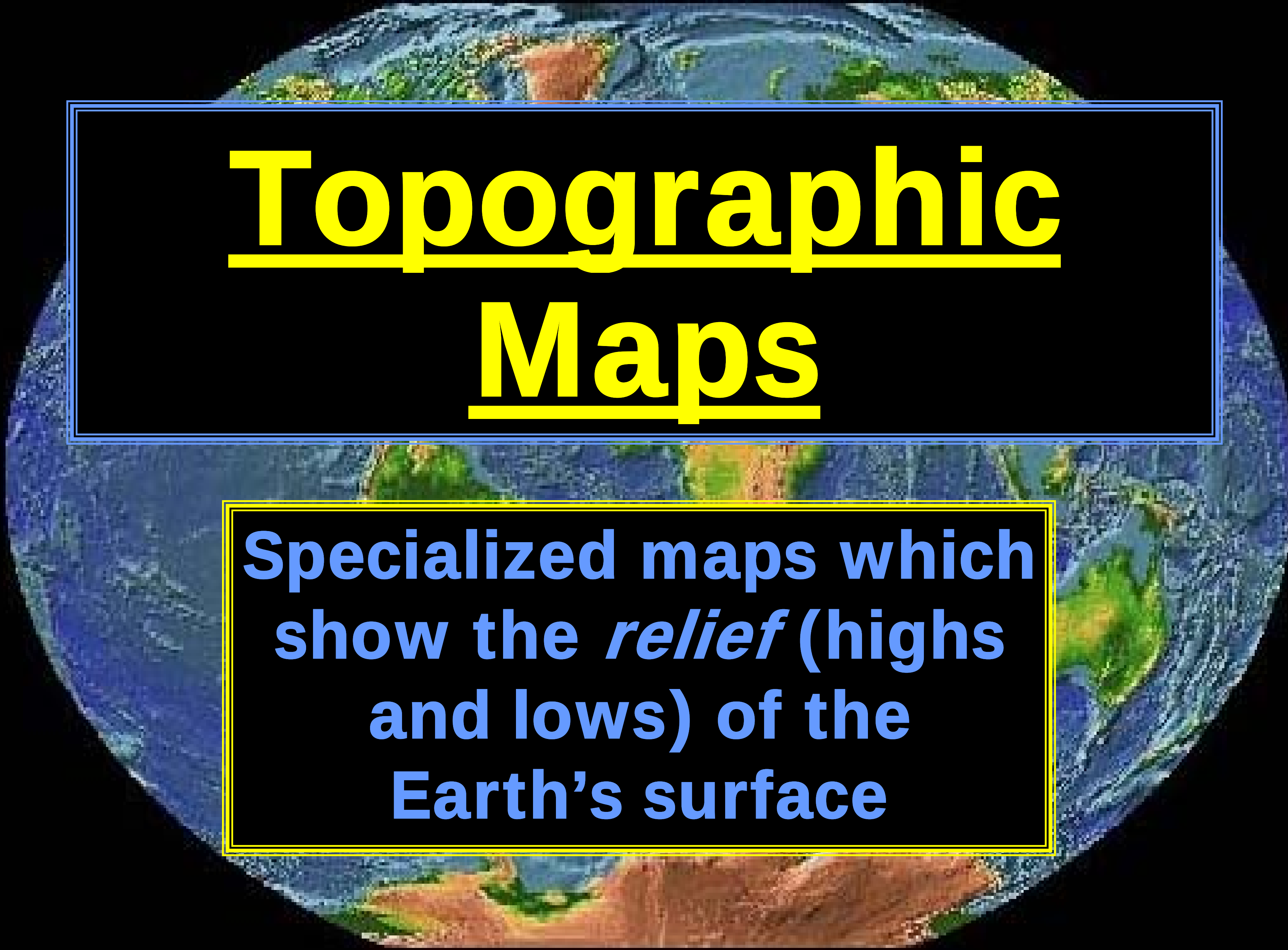
- **True North** - a line from any point on the Earth's surface that runs to the *true* north pole (the north point of Earth's axis of rotation). All lines of longitude are true north lines.

- **Magnetic North** - the direction from any point on Earth to the *magnetic* north pole, as indicated by the north-seeking needle of a magnetic instrument.

- **Declination** - the angular difference between true north and magnetic north.



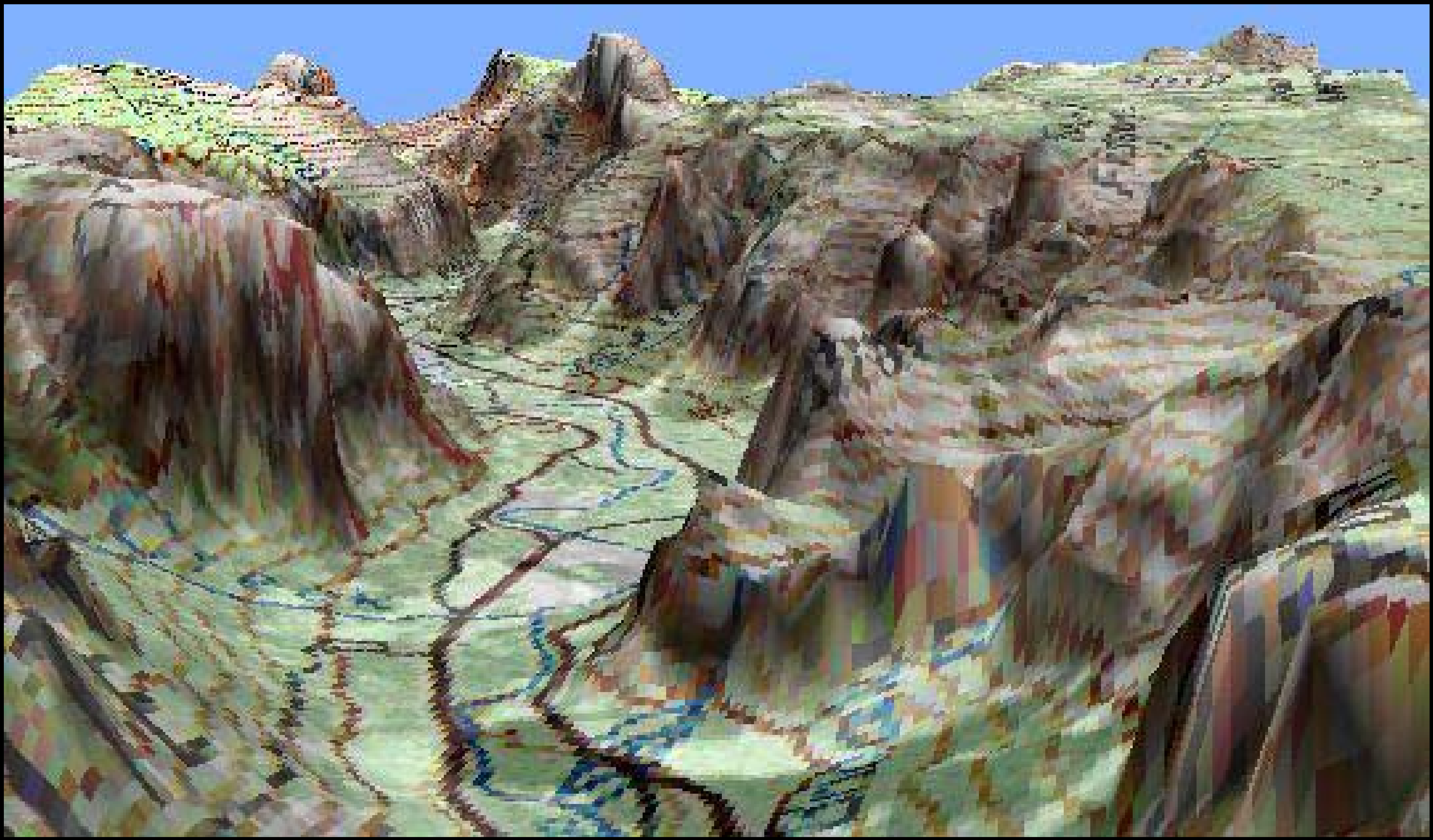
True North & Magnetic North are different because of Earth's shifting Magnetic Fields! In NYS the magnetic declination is approximately 12 degrees west of True North



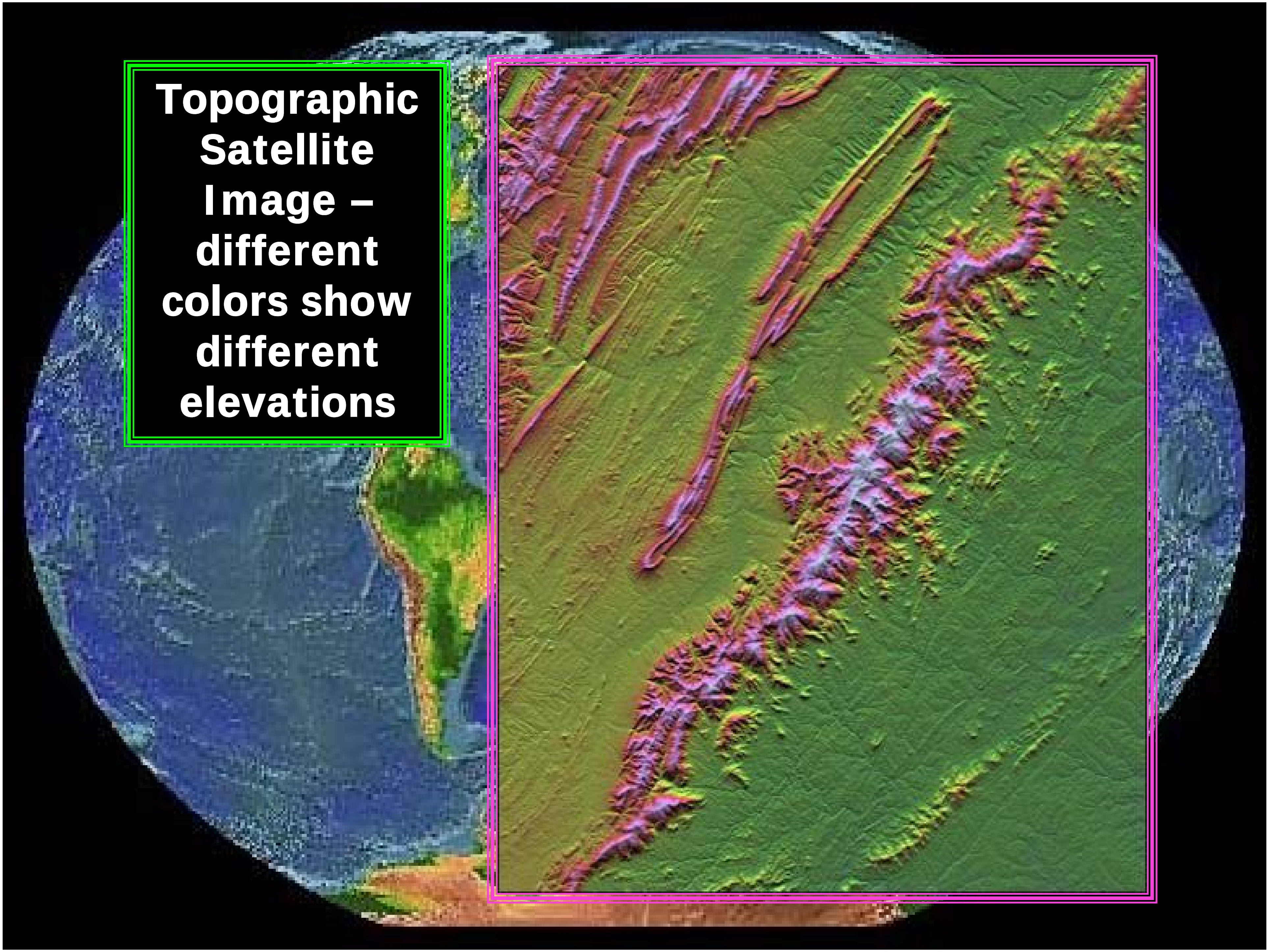
Topographic Maps

Specialized maps which show the *relief* (highs and lows) of the Earth's surface

Computer Generated 3-D Topographic Map!

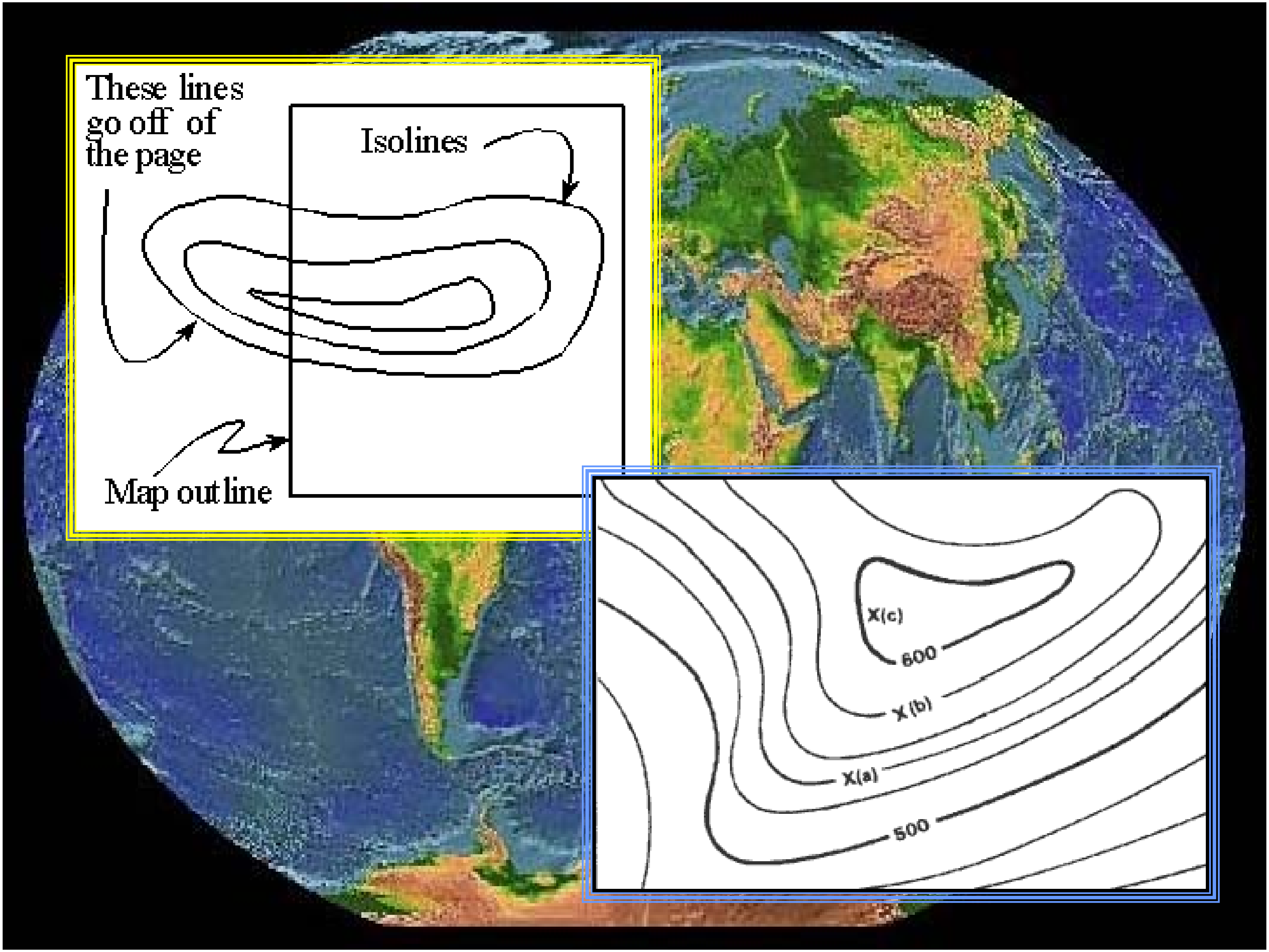


Topographic Satellite Image – different colors show different elevations



Topo map parts...

- relief is shown with *iso*lines (*iso = same*) called contour lines
  - connect points of the same elevation above sea level
  - show the shape of the 3-D land on a 2-D map!
- difference in elevation between two consecutive contour lines is called the contour interval
- An index contour has its elevation noted (written) on it


These lines go off of the page
Isolines
Map outline
X(c)
600
X(b)
X(a)
500

Topo map parts…

- A **benchmark** is a point where the actual (true) elevation is known
  - A benchmark is shown on the map by the letters BM and its elevation next to it (ex. BM1078). This means that that point's true elevation is 1,078 feet above sea level

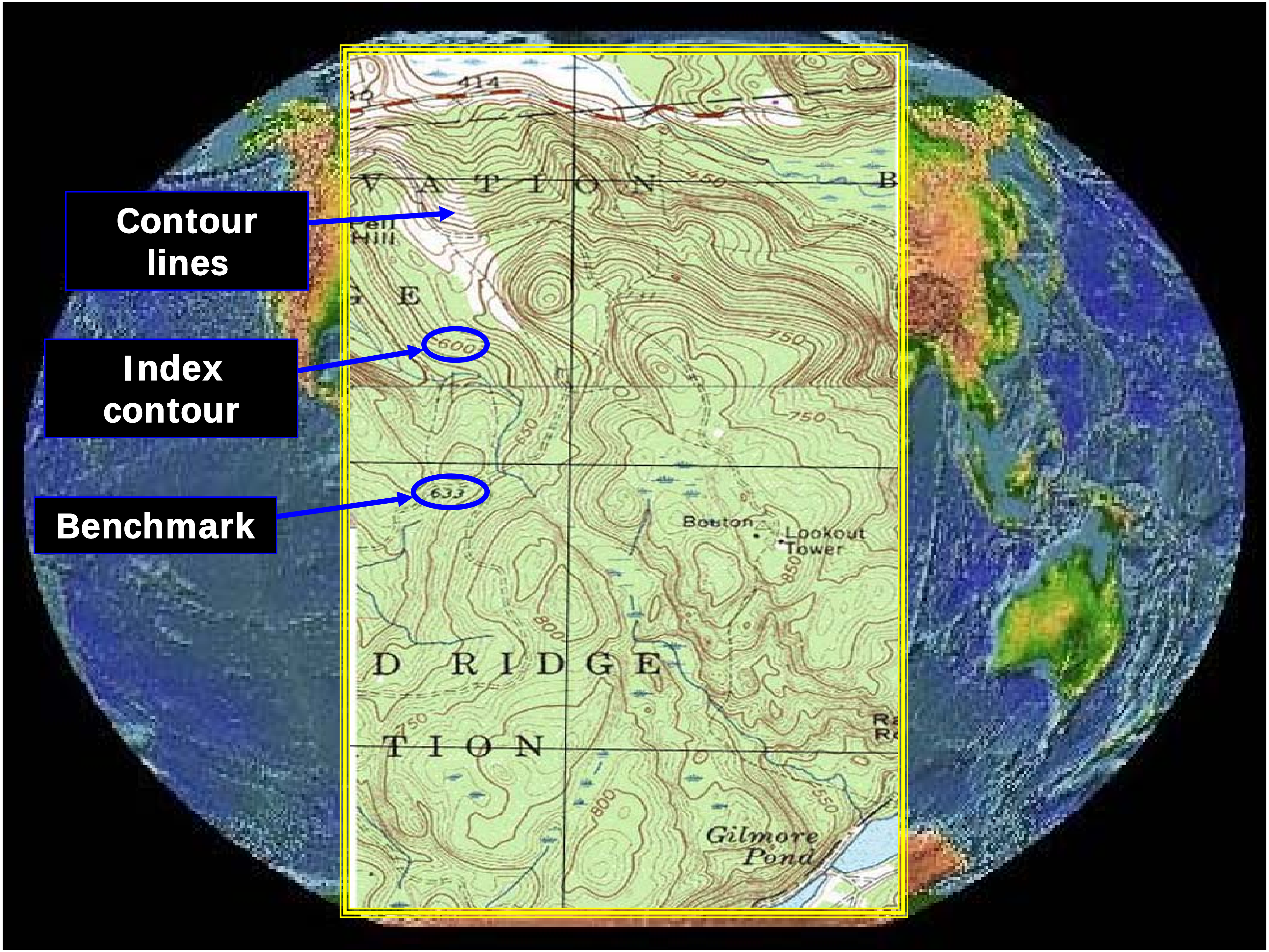
Topo map parts...

Benchmarks may sometimes be seen in their locations. They were set by USGS surveyors and look like this

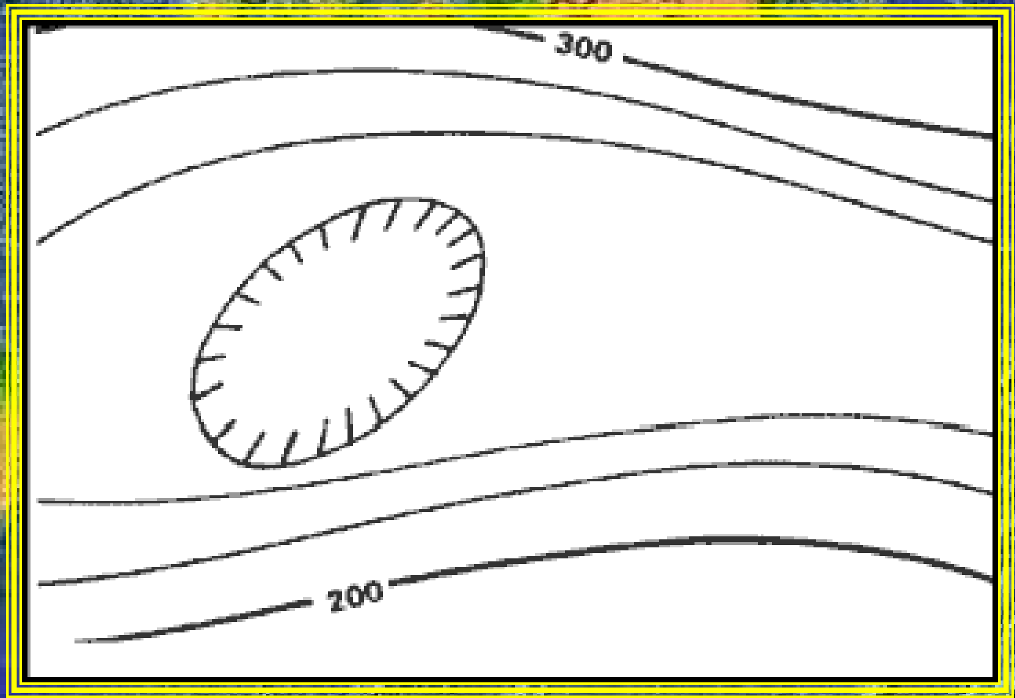
Topo map parts...

Topo map parts…

- **Depression contours** show where the elevation decreases (a hole, volcano crater, etc.)
  - When reading the depression contour, the elevation of the first one is the same elevation of the "regular" contour line before it. The next one decreases the same amount as the contour interval.

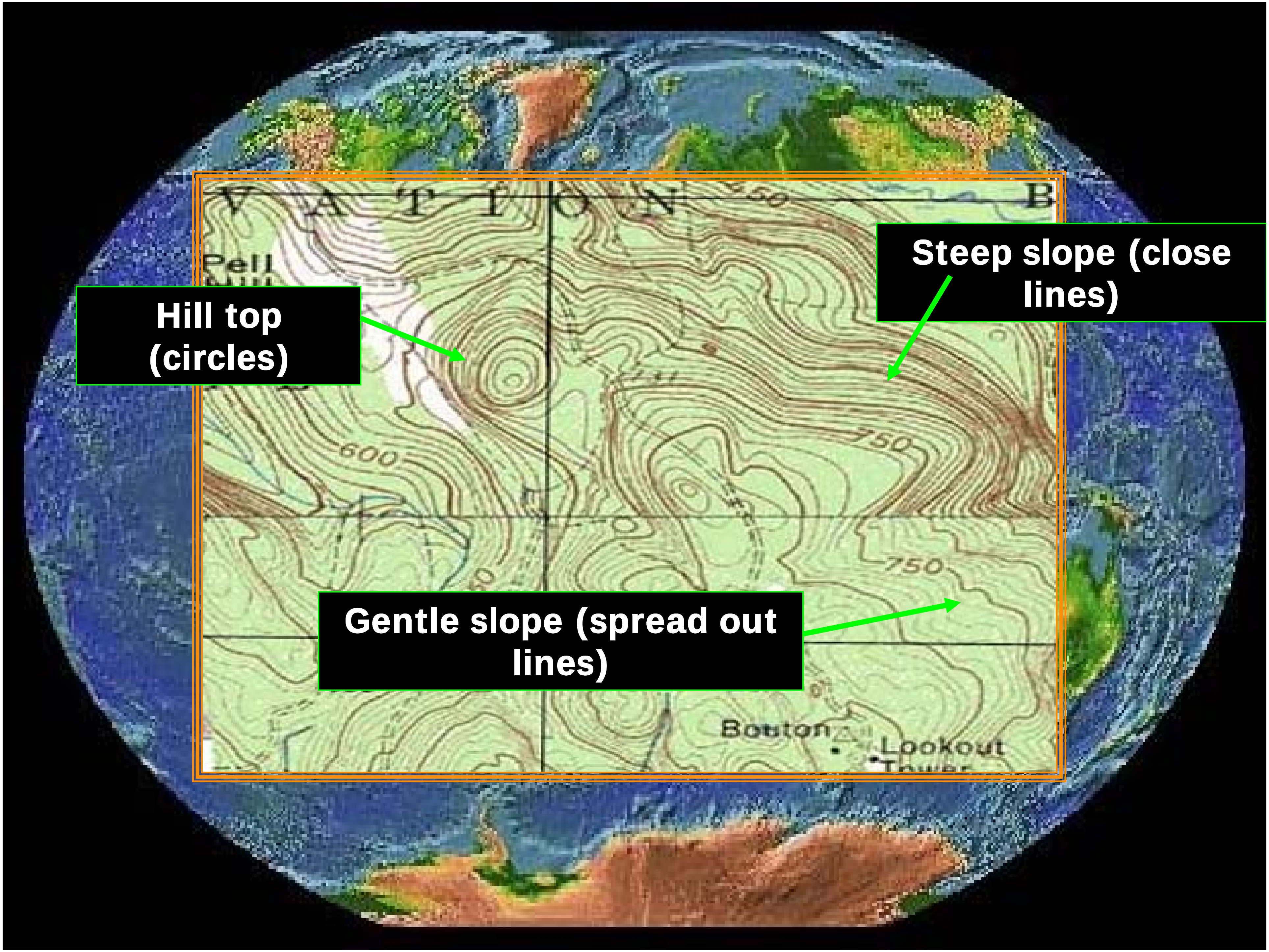

Contour lines
Index contour
Benchmark
600
633
414
750
650
800
850
550
V A T I O N
B
G E
D R I D G E
T I O N
Bouton
Lookout Tower
Gilmore Pond

Depression contours are shown with dashed lines inside of the contour line circles (the ends of the dashes point to lower ground)



Landforms on Contour Maps

- The *steepness* of an area is shown by the closeness of the contour lines
  - The closer the contour lines are together, the steeper the area (cliff, etc.)
  - When the contour lines are spread out, the land is relatively flat.
- A closed circle after a series of increasing contour lines shows the top of a hill or mountain

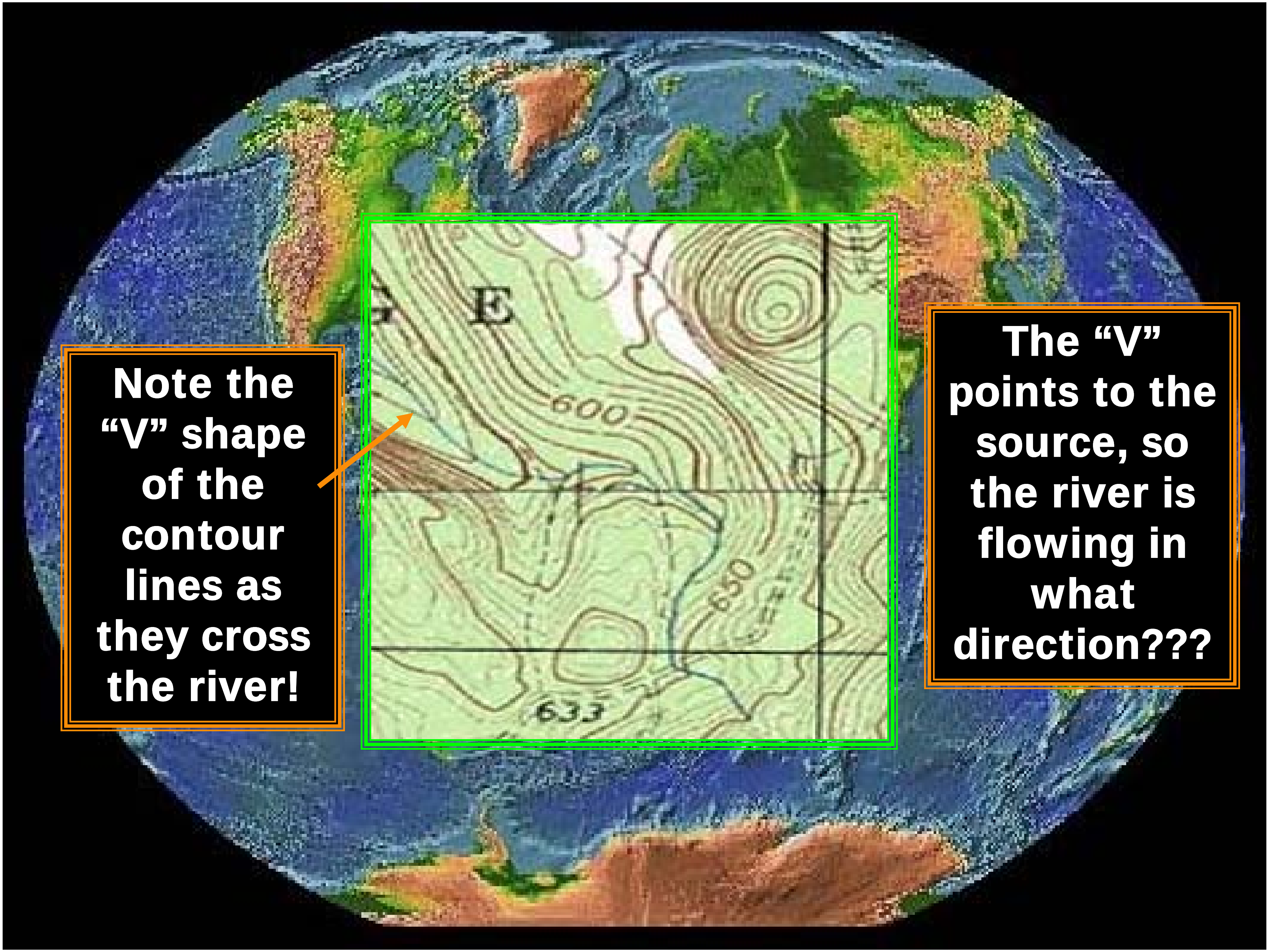


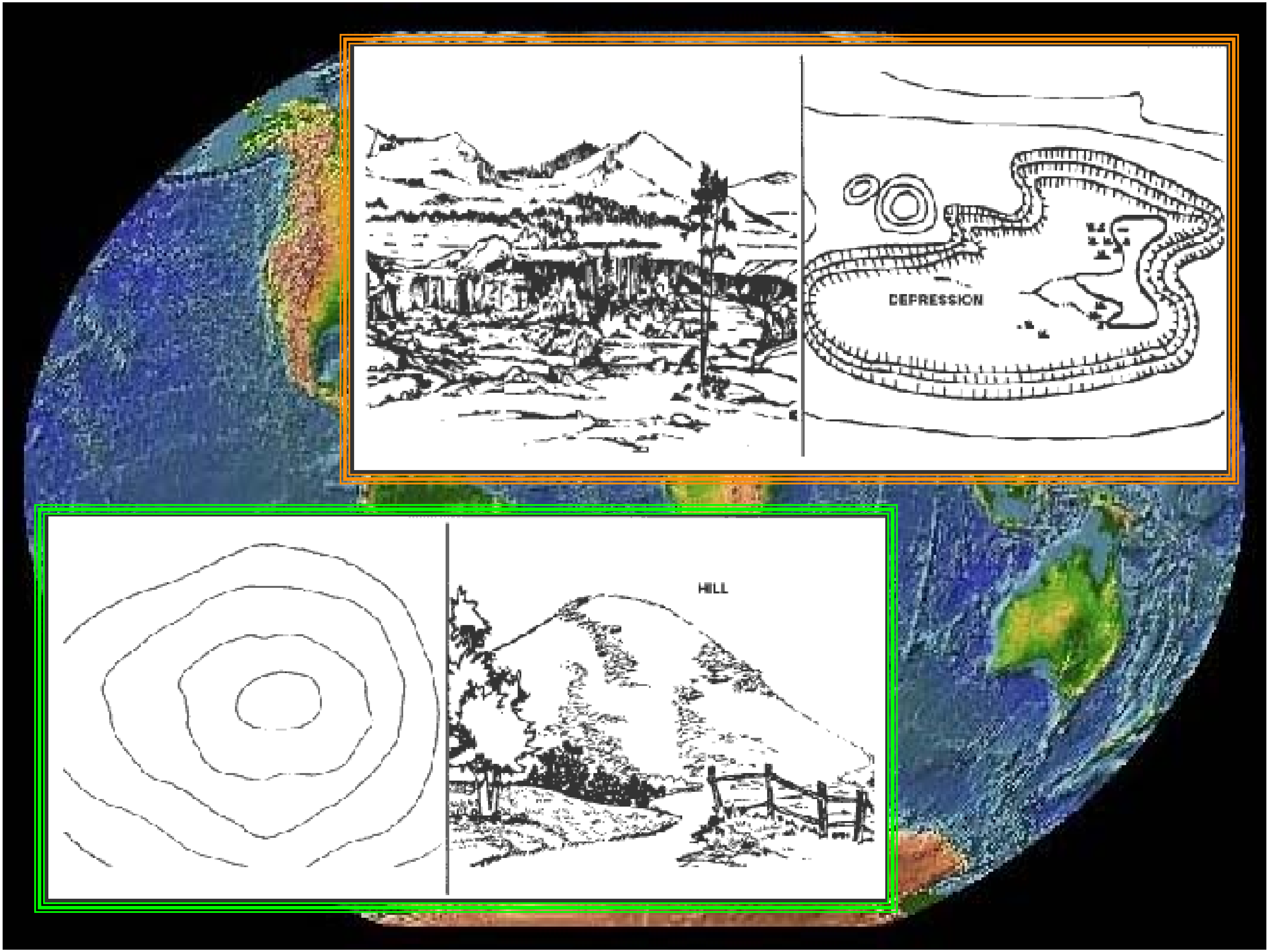
Hill top (circles)
Steep slope (close lines)
Gentle slope (spread out lines)
Pell
600
750
750
Boston
Lookout

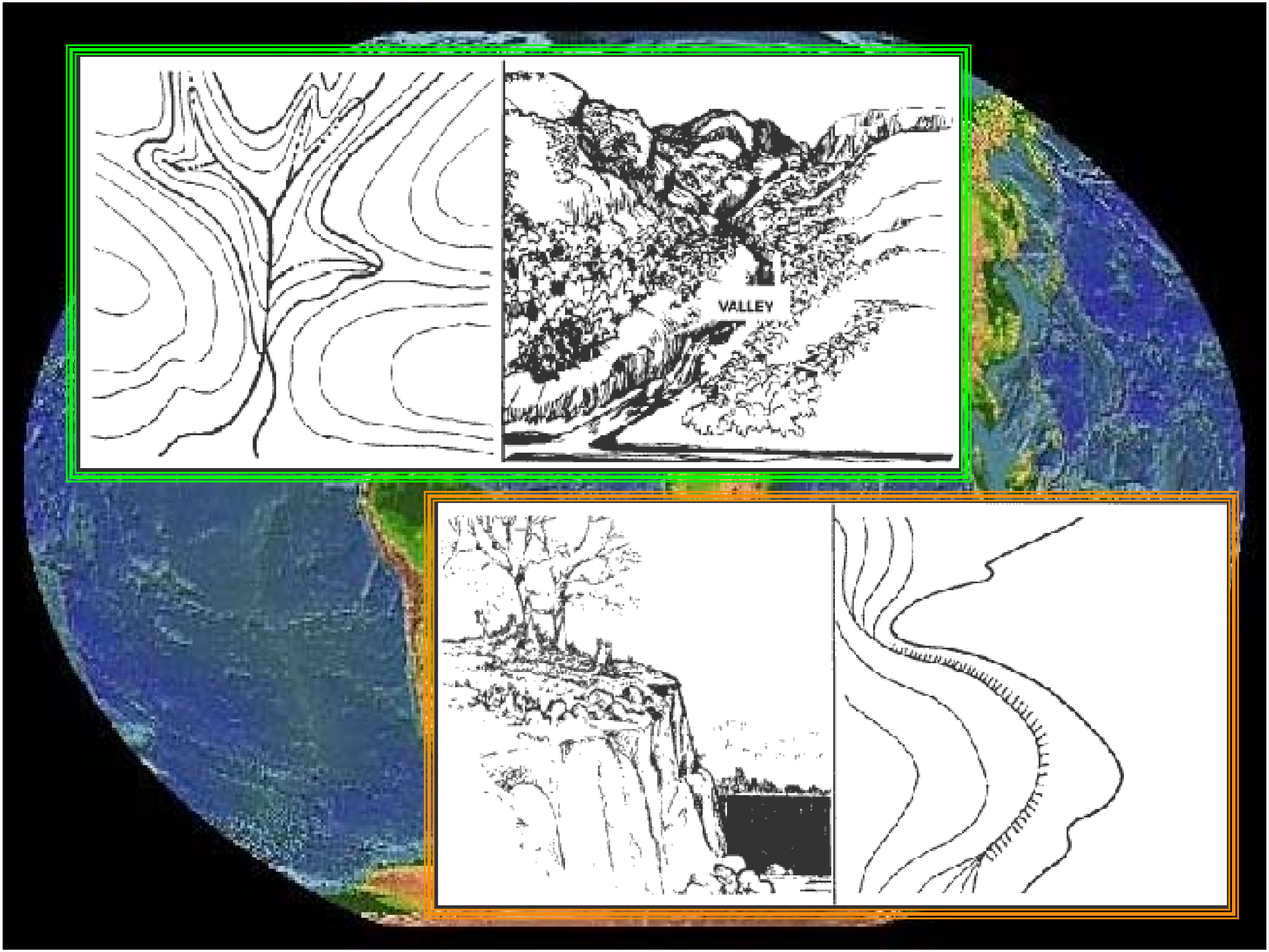
Landforms on Contour Maps

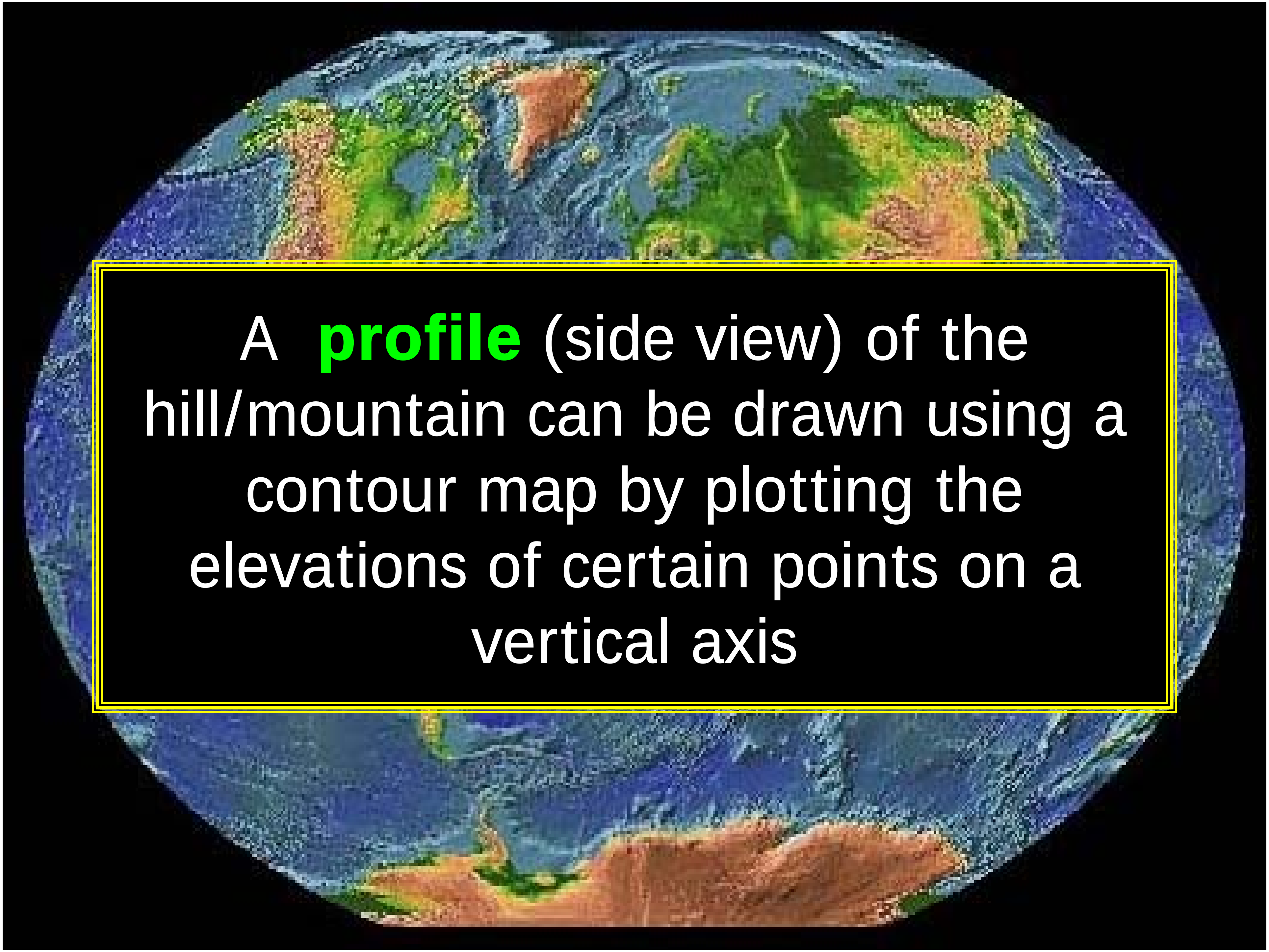
- **When a contour line crosses a stream or river, the contour line bends and forms a “V” shape**

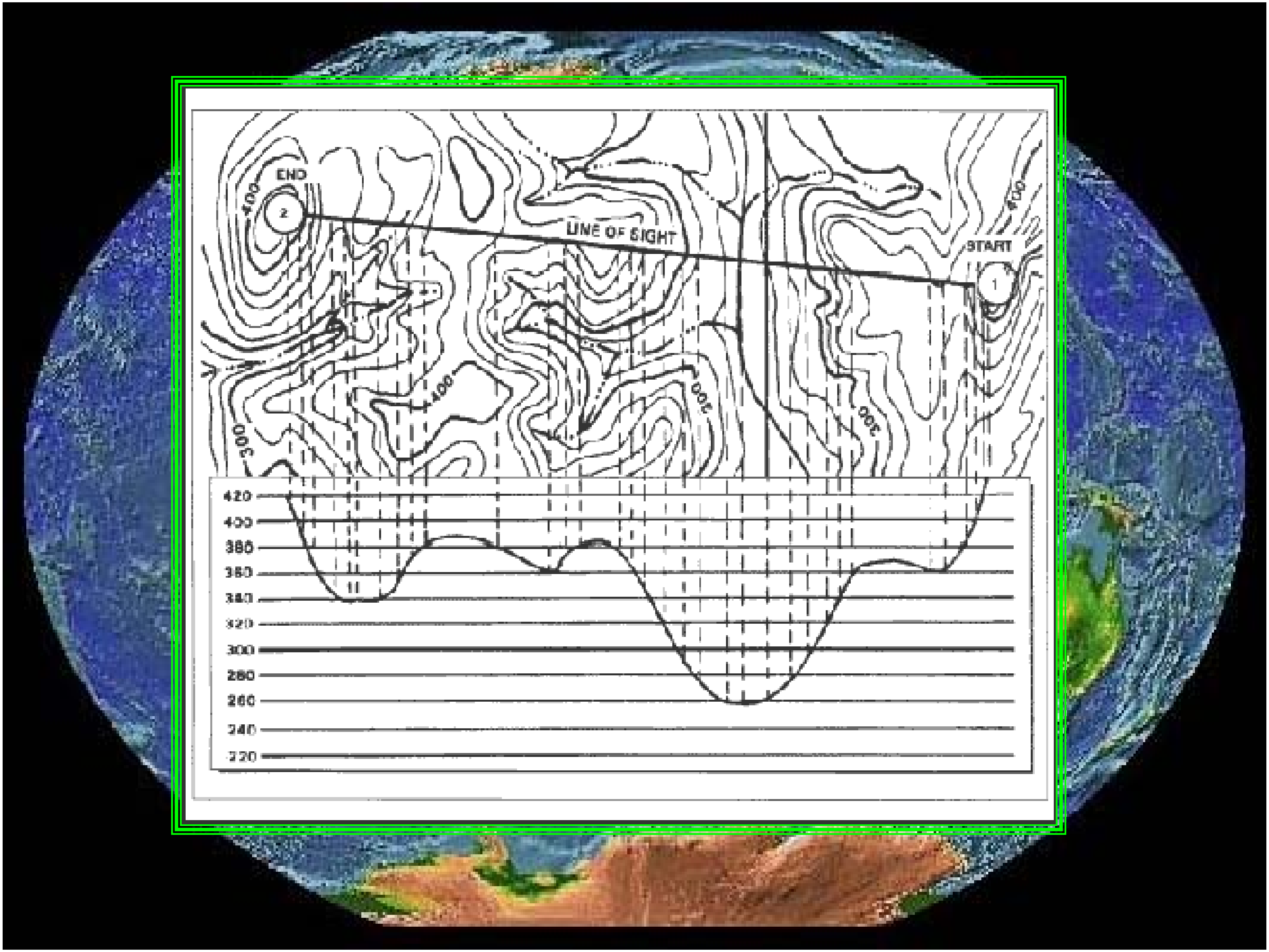
- **The point of the “V” shows the direction that the water is coming *from***
  - **The “v” points to the *SOURCE* of the river!**


Note the "V" shape of the contour lines as they cross the river!
E
600
650
633
The "V" points to the source, so the river is flowing in what direction???


DEPRESSION
HILL


VALLEY


A **profile** (side view) of the hill/mountain can be drawn using a contour map by plotting the elevations of certain points on a vertical axis

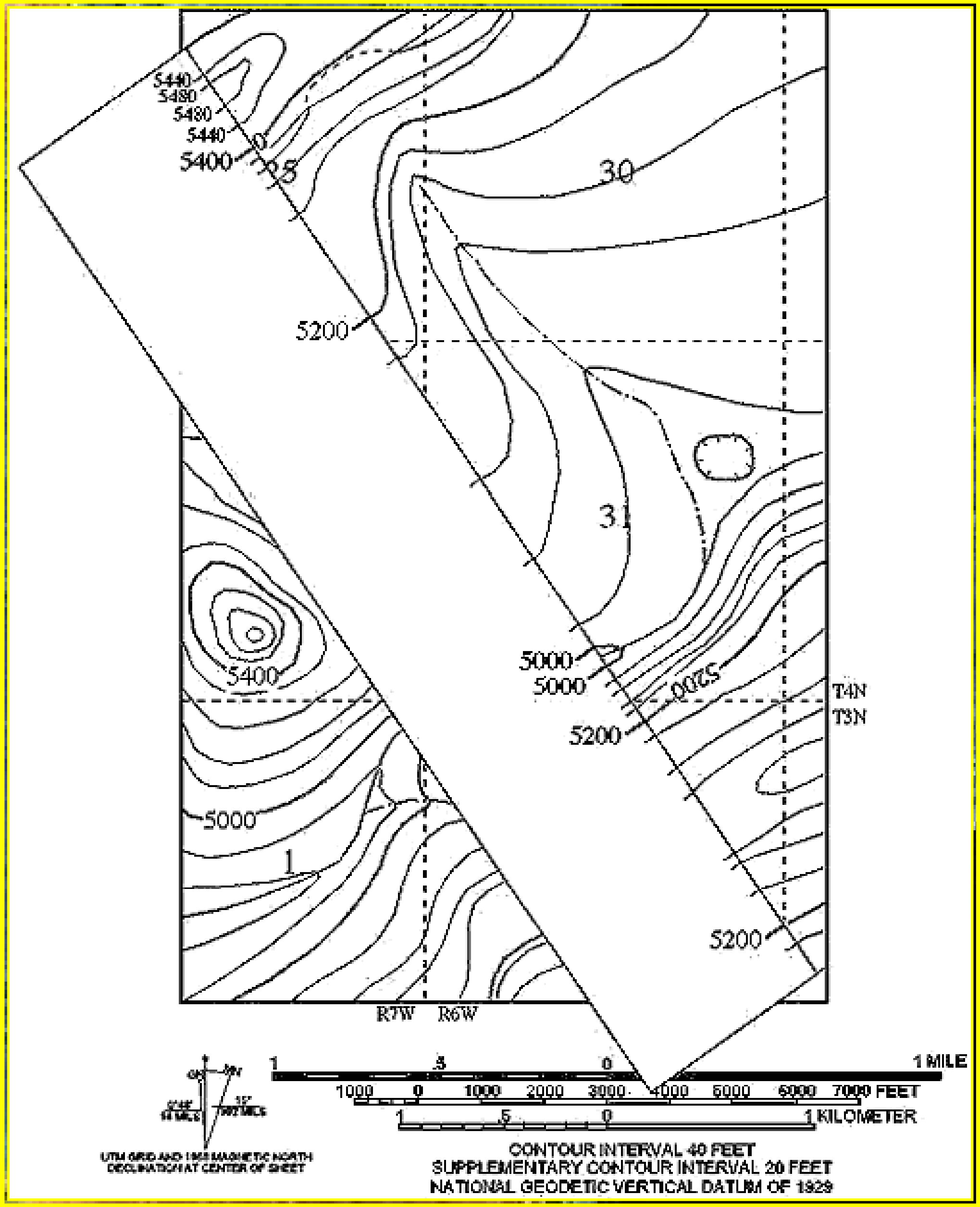


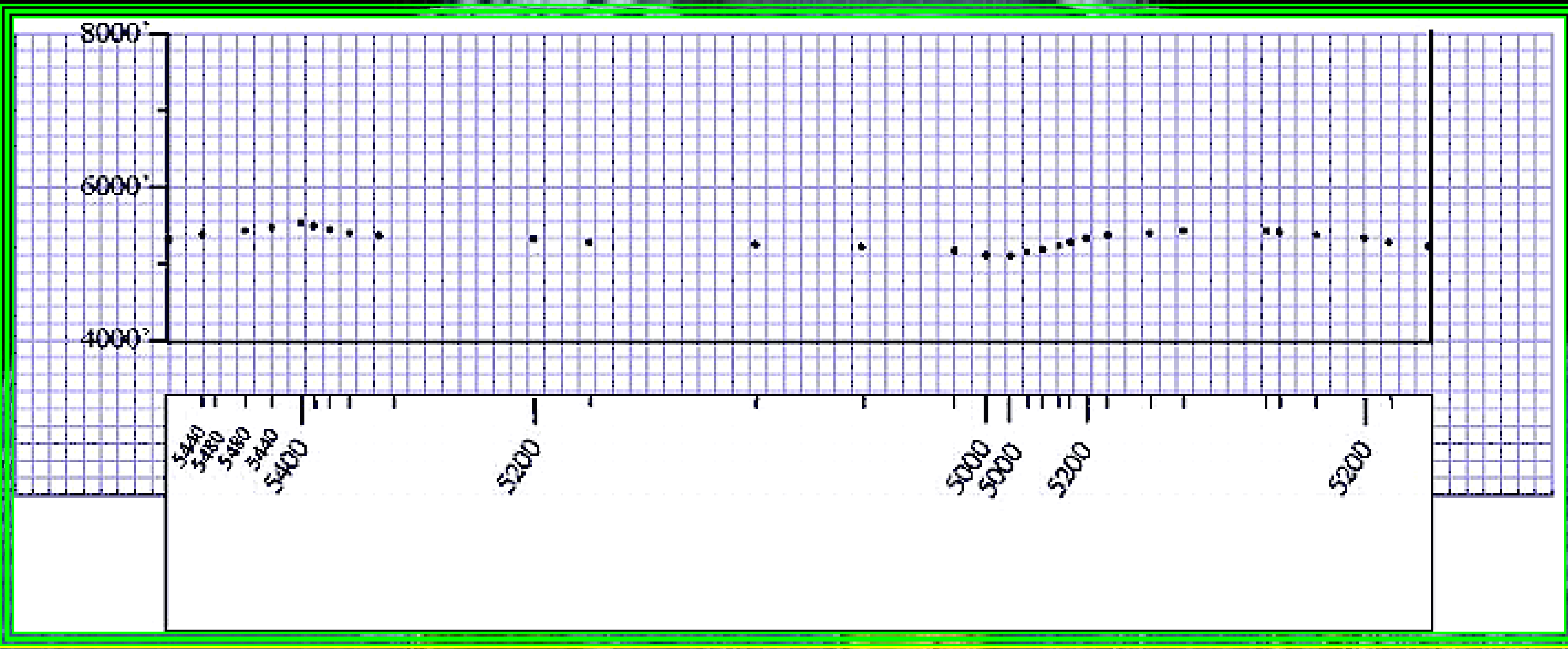
END
START
LINE OF SIGHT
400
300
420
400
380
360
340
320
300
280
260
240
220

Place a paper strip over the line you want to draw a profile of.

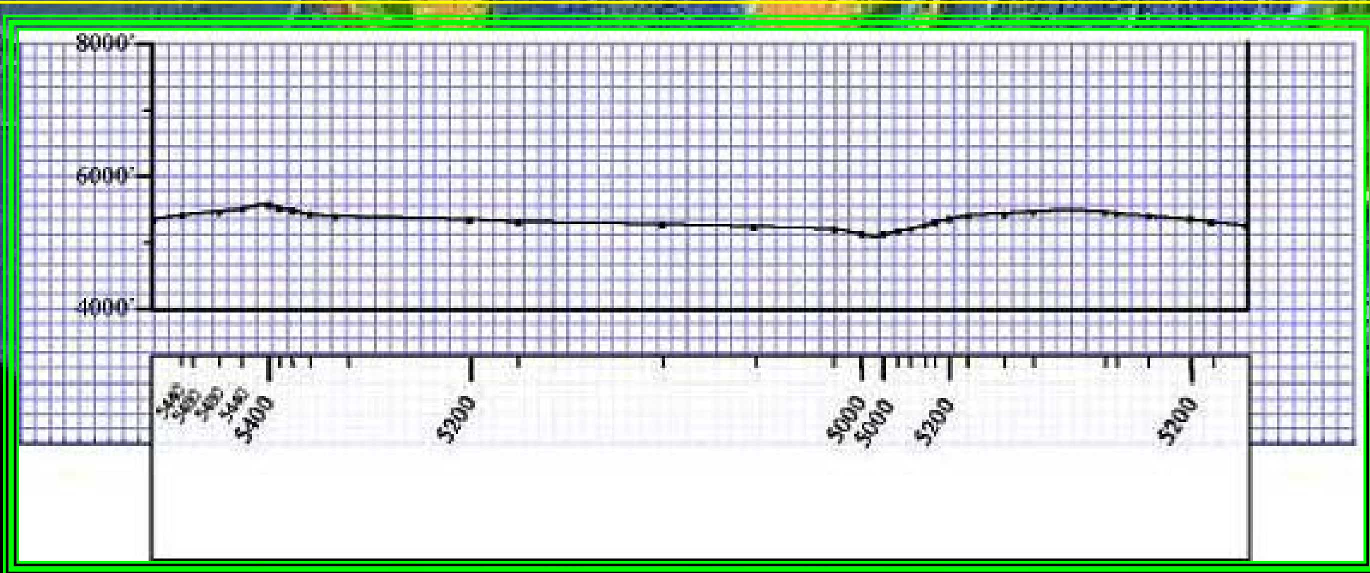
Mark clearly each line of contour of your line.

Below these marks, write down the elevation of each line of contour.





Place your paper onto a graph. Copy each point. Connect the dots! EASY!



The slope or gradient of the hill can be determined by using the equation on Page 1 of your Handy Dandy ESRT

$$\text{Gradient} = \frac{\text{difference in elevation}}{\text{distance}}$$