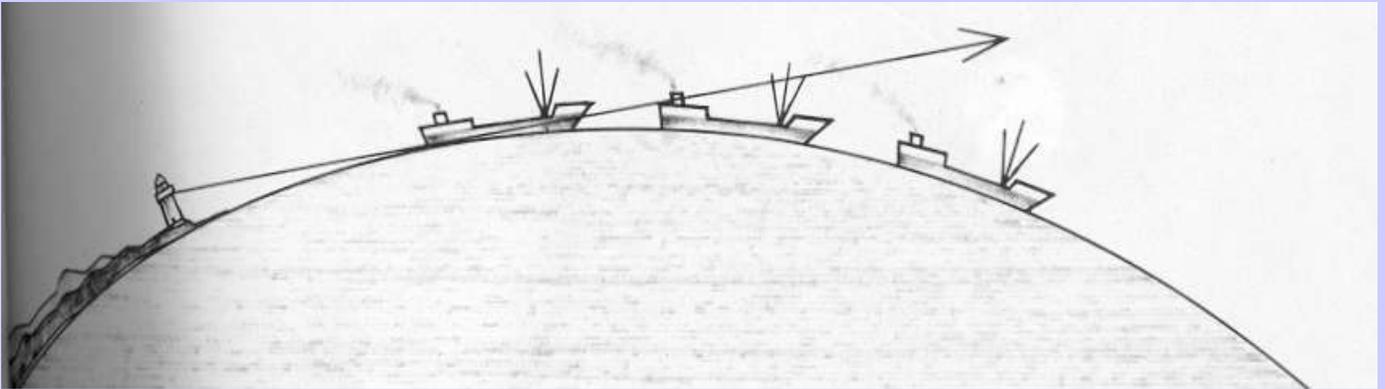# The Earth Model: Measuring the Earth

I.   The Shape of the Earth

   A.   The Earth is very nearly a perfect sphere (Oblate Spheroid).
   The difference between the Earth's polar diameter and its
   equatorial diameter is 42 km.

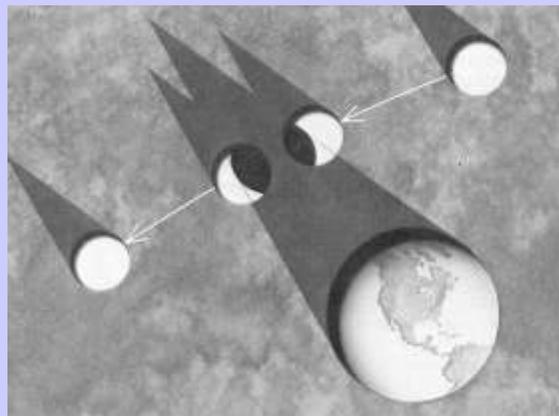II.   Evidence for the Earth's shape

   A.   Sinking Ships –

   B.   Altitude of Polaris –

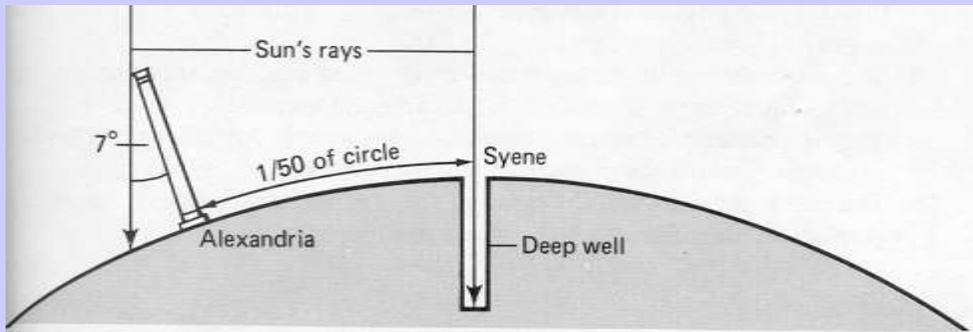© 2003 Jerry Lodriguss

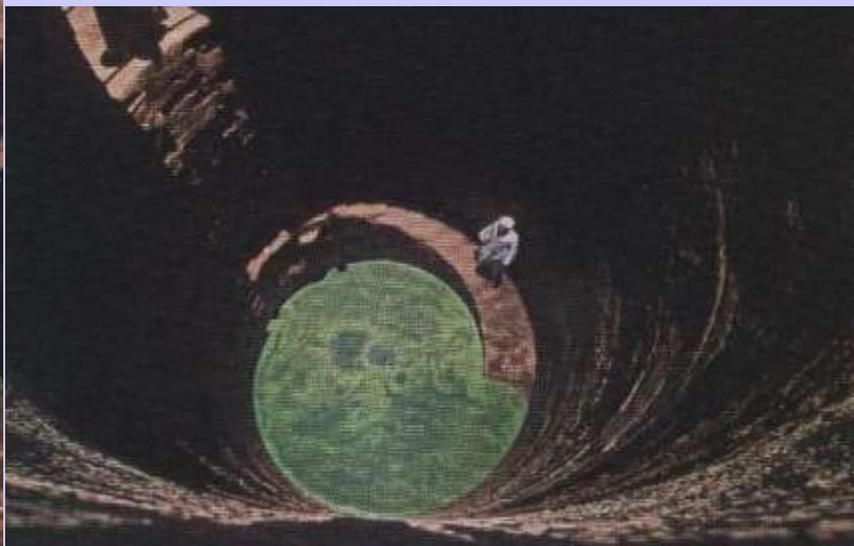## C. Photographs from Space ~

D. Shadow on the Moon ~

III.   How Can the Earth's Size be Determined ?

IV.   The Earth's size was estimated accurately over two thousand years ago by an Egyptian scientist, Eratosthenes.

Eratosthenes 's Formula:

$$\frac{shadow\ angle}{360\ degrees} = \frac{distance\ between\ two\ points}{circumference}$$

pole in
Alexandria

well in
Syene

IV. The Outer Parts of the Earth

A. The Atmosphere - The thin envelope of gas that surrounds the Earth.

B. The Hydrosphere - This is all of the water on Earth, which includes salt water, surface freshwater, groundwater, and water vapor.

C. Lithosphere - This is the solid outer layer of rock that covers the earth to a depth of about 100 kilometers.

Average Chemical Composition of Earth's Crust, Hydrosphere, and Troposphere

| ELEMENT (symbol)	CRUST		HYDROSPHERE	TROPOSPHERE
	Percent by Mass	Percent by Volume	Percent by Volume	Percent by Volume
Oxygen (O)	46.40	94.04	33.0	21.0
Silicon (Si)	28.15	0.88		
Aluminum (Al)	8.23	0.48		
Iron (Fe)	5.63	0.49		
Calcium (Ca)	4.15	1.18		
Sodium (Na)	2.36	1.11		
Magnesium (Mg)	2.33	0.33		
Potassium (K)	2.09	1.42		
Nitrogen (N)				78.0
Hydrogen (H)			66.0	
Other	0.66	0.07	1.0	1.0

V.   Locating Positions on the Earth

A.   Latitude-Longitude Coordinate System ~

   1.   Latitude ~

   2.   Longitude ~

   3.   Lines of both longitude and latitude are measured in degrees, with each degree being sub-divided into 60 minutes. 43 degrees 30 minutes.
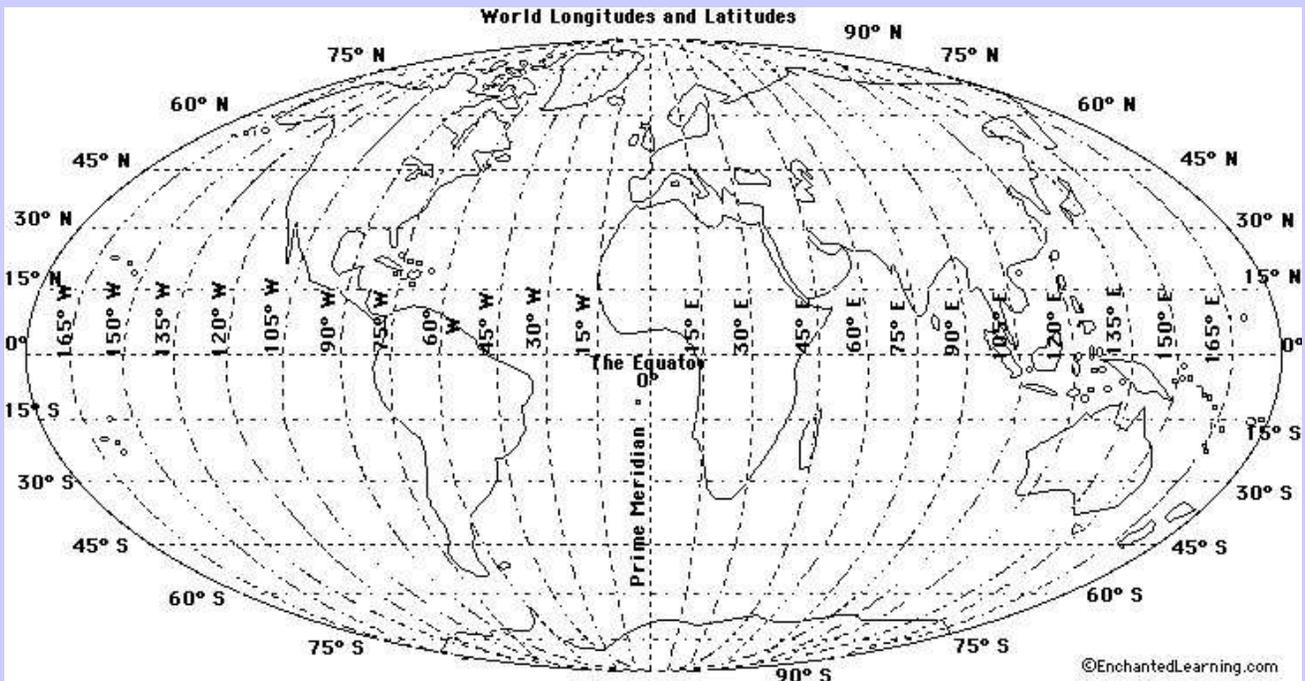
VI. Fields - a field is any region of space that has measurable quantities at every point.

A. field maps represent any quantity that varies in a region of space.

B. Isolines - Isolines are lines that connect points of equal field value. Common isolines used include isotherms (temperature), isobars (pressure), contour lines (elevation).

C. Gradient -

$$\text{Gradient} = \frac{\text{amount of change in field value}}{\text{distance through which change occurs}}$$

VII. Topographic Maps - a topographic map, or contour map, is a scale model of the earth's surface that shows its three dimensional surface features in two dimensions.

A. Distance on Maps - Distance can be calculated by using the horizontal distance scale.

B. Direction - Direction is noted on topographic maps by a north pointing arrow, which usually coincides with the top of the map.

C. Contour Interval – elevation value of each contour line

D. Water flow – Water flows from high elevation to low. Contour lines point upstream when crossing a river or stream.
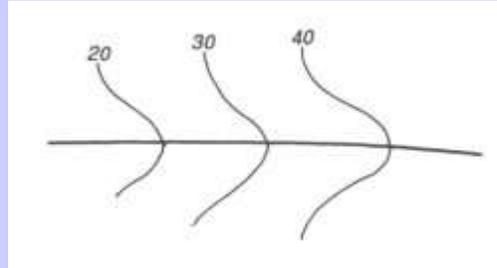
E. Depression – Hatchered lines mark a decrease in elevation
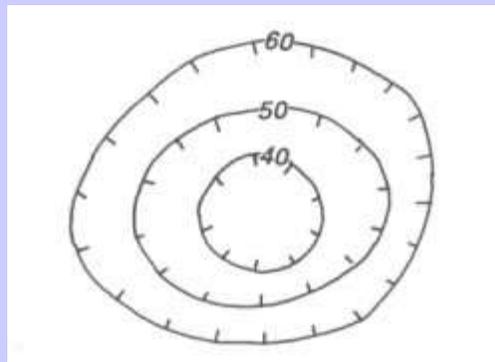
F. Map Profiles – a map profile is what a cross section of the land would look like between two points.