

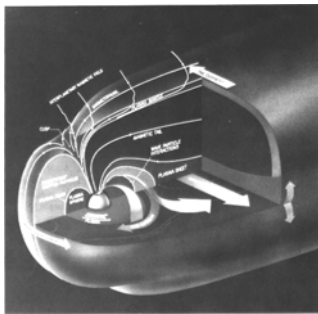
{04} The Compass

Map Interpretation & GPS
 Spring 2010
 M. Pesses

Direction



The Magnetosphere



Artist Rendition of Solar Wind
 Created by: K. Endo

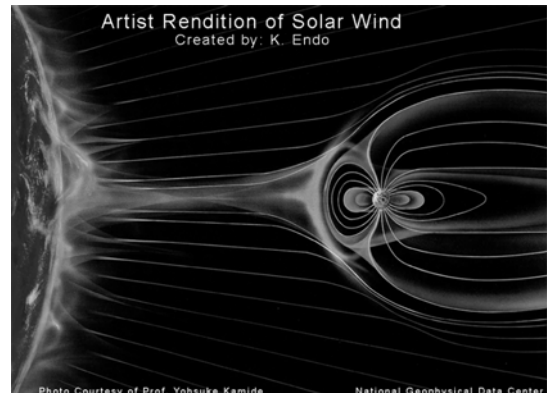


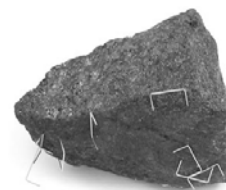
Photo Courtesy of Prof. Yohsuke Kamide National Geophysical Data Center



Lodestone

Naturally occurring ore

- Not only magnetic, but can magnetize iron
- Exhibits polarity



Lodestone

- ‡ A.D. 1157, English monk recorded magnetizing a needle for navigation
- ‡ Chinese records of navigational use around same time



The Compass

- ‡ One of the most important inventions ever



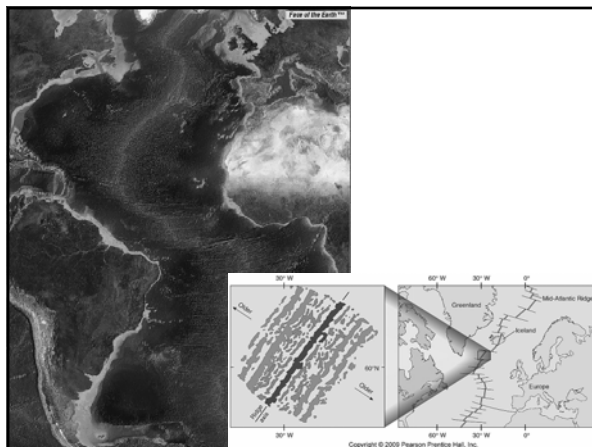
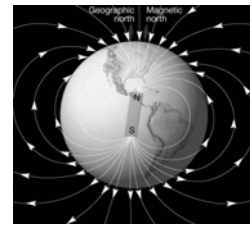
The Compass

- ‡ Even good compasses never consistently pointed north



The Magnetic Poles

- ‡ Magnetic field exhibits polarity
- ‡ **Geomagnetic reversal**
 - 9 times in Earth's history



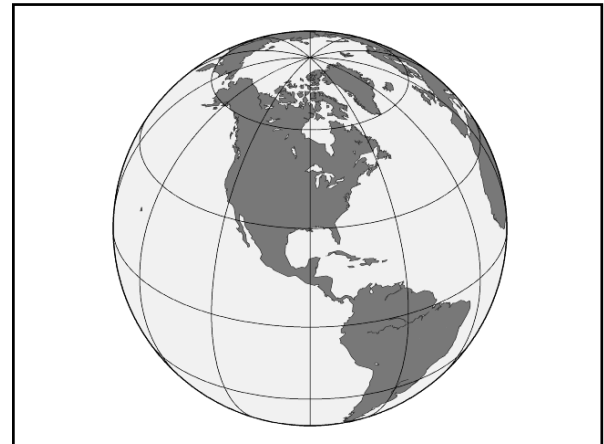
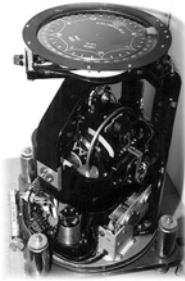
Isn't North North?

Three types of north

1. **True north**
2. **Grid north**
3. **Magnetic north**

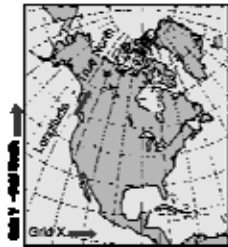
True North

- ‡ Also called **"geographic north"**
 - The north of **Polaris**, follows lines of longitude
- ‡ A **gyrocompass** points to true north



Grid North

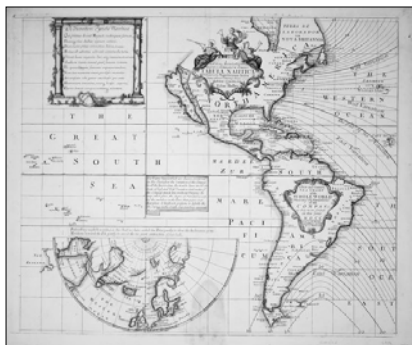
- ‡ Follows direction of a coordinate system's grid lines
 - UTM, State Plane, etc.



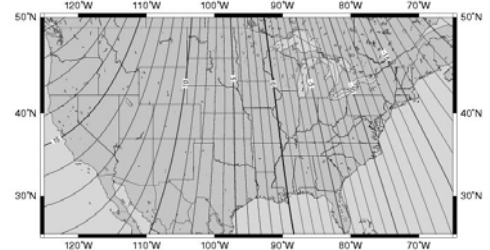
Magnetic North

- ‡ Magnetic poles not aligned with geographic poles
 - Magnetic North = 83° N, 114° W
 - *This means a magnetic compass will not point to true north!*
 - **magnetic declination**

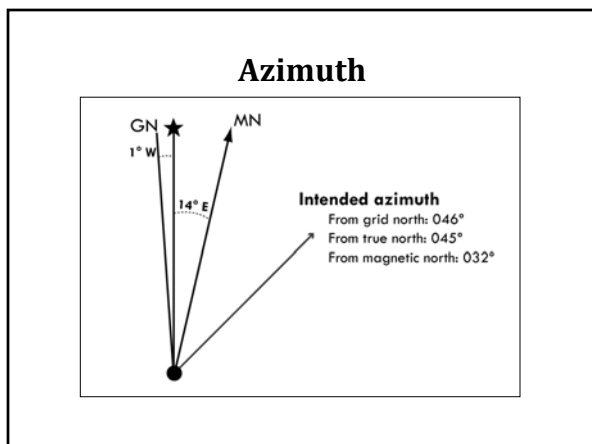
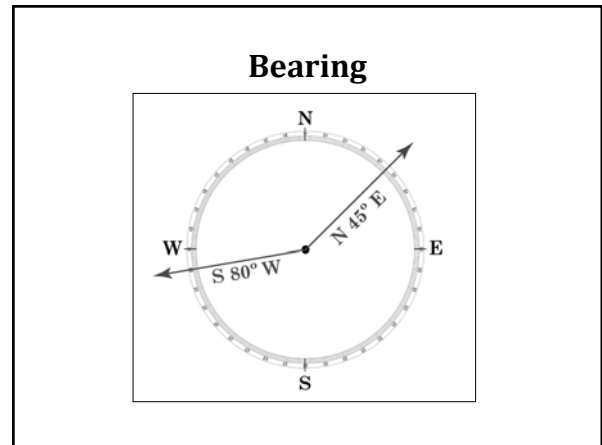
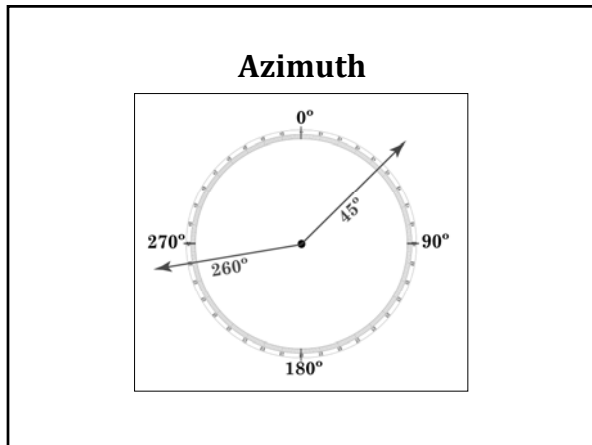
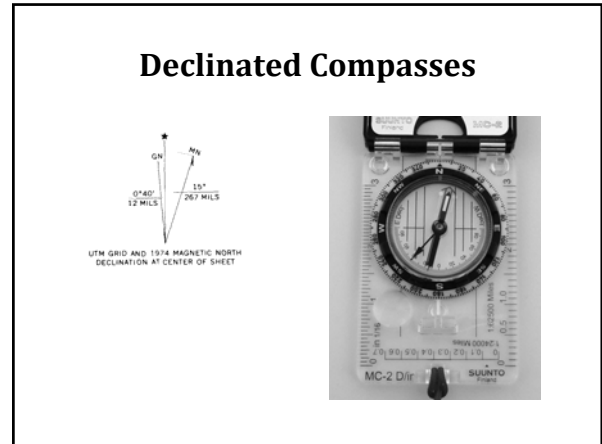
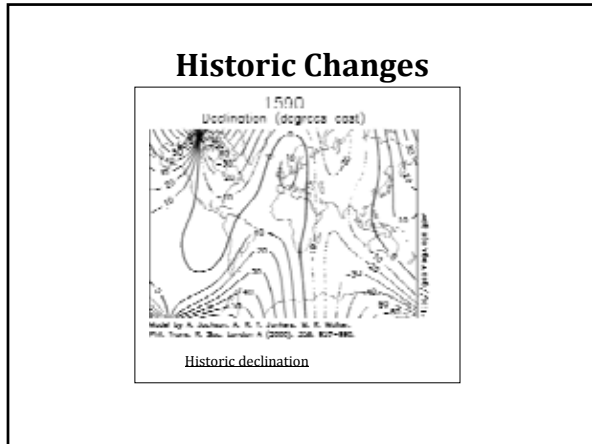
Declination



Magnetic Declination for the U.S. 2004



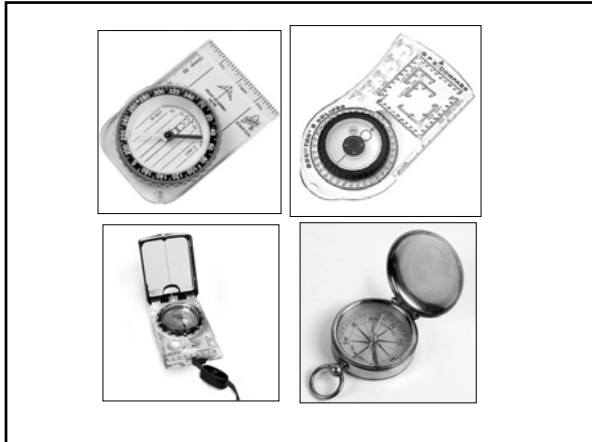
Mercator Projection
 Contours of Declination of the Earth's magnetic field. Contours are expressed in degrees.
 Contour Interval: 1 Degree (Positive declinations in blue, negative in red).
 Produced by NOAA's National Geophysical Data Center (NGDC), Boulder, Colorado
<http://www.ngdc.noaa.gov>
 Based on the International Geomagnetic Reference Field (IGRF), Epoch 2000 updated to December 31, 2004.
 The IGRF is developed by the International Association of Geomagnetism and Aeronomy (IAGA), Division V.



Compass Deviation

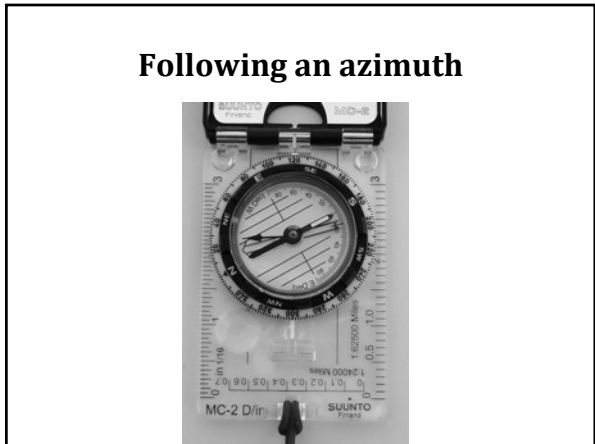
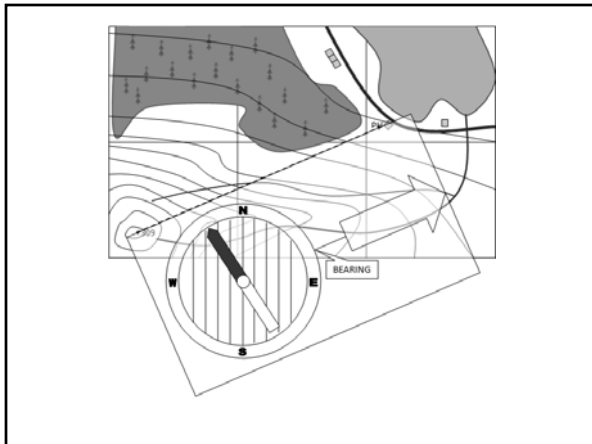
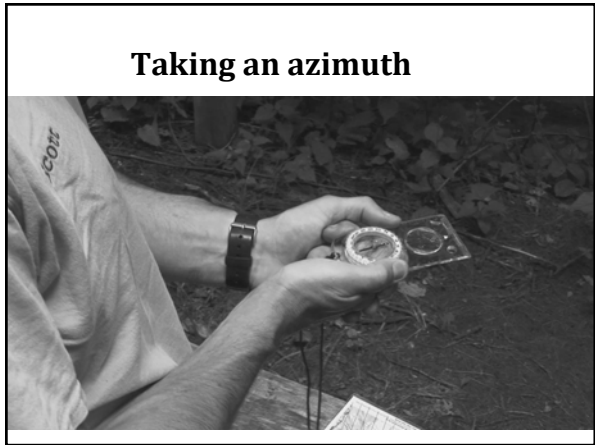
‡ Yet another factor with magnetic compasses

- Magnets are drawn to iron, so nearby metal can ruin an azimuth reading.
- *Be aware of your surroundings!*



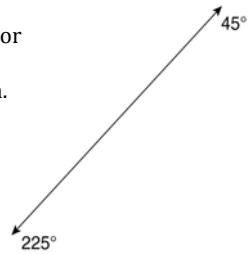
Navigation

- ‡ Direction
- ‡ Distance
- ‡ Orienting map



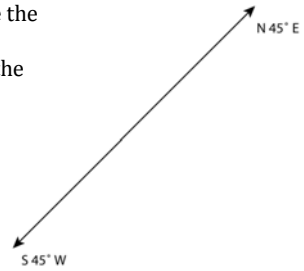
Back-azimuth

‡ To go back, you simply need to add or subtract 180° from your initial azimuth.



Back-bearings

‡ Simply change the two direction references in the initial bearing



Pacing distance



Orienting the Map

