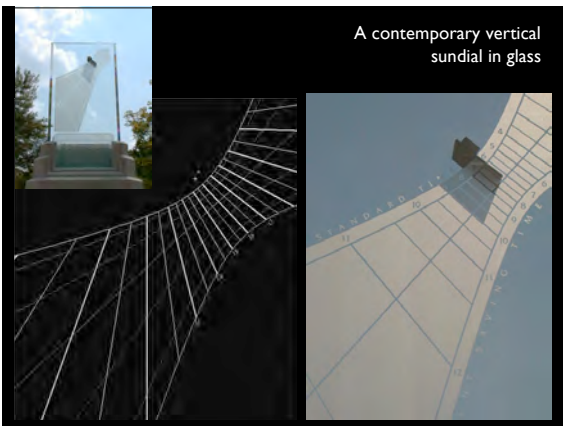
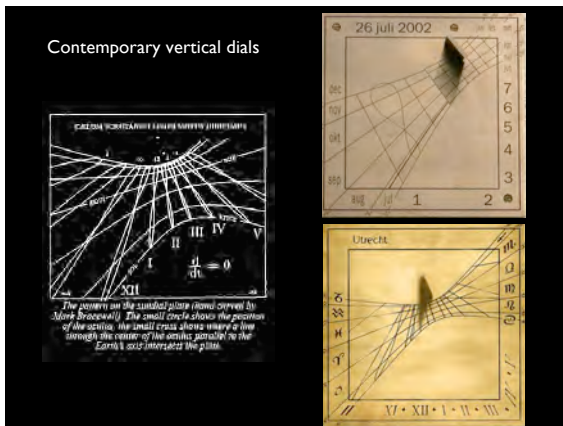




announcements 5/1/08

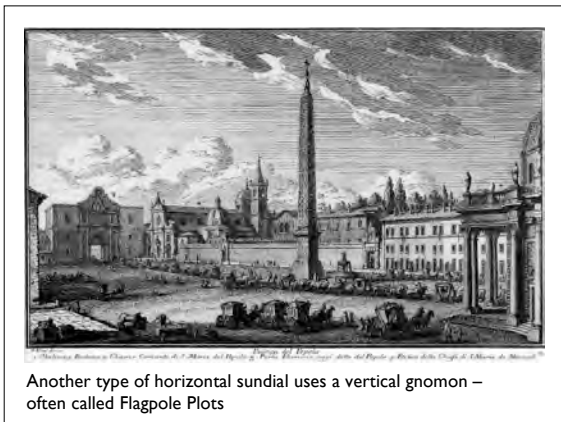
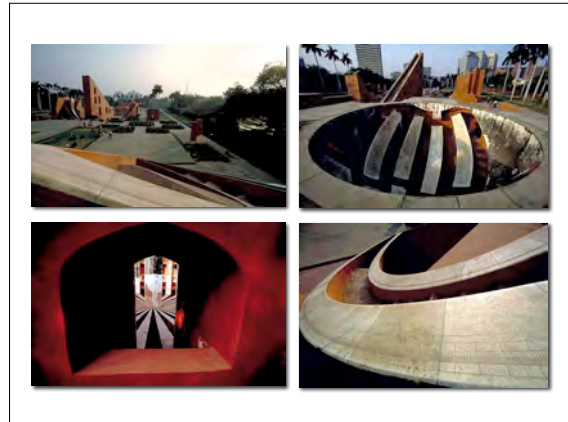
Information Meeting:
INDIA program winter 2009
Friday May 2, 12:30, Gould 208P

Assignment 4:
Shading Model Studies
Available Friday, 5pm; due in 2 weeks (week 7)

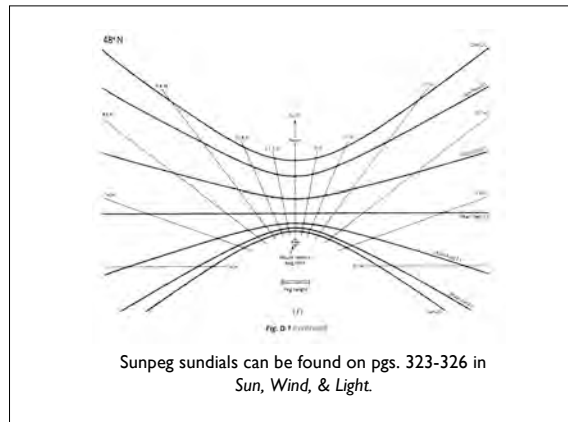


The Jantar-Mantar of Delhi

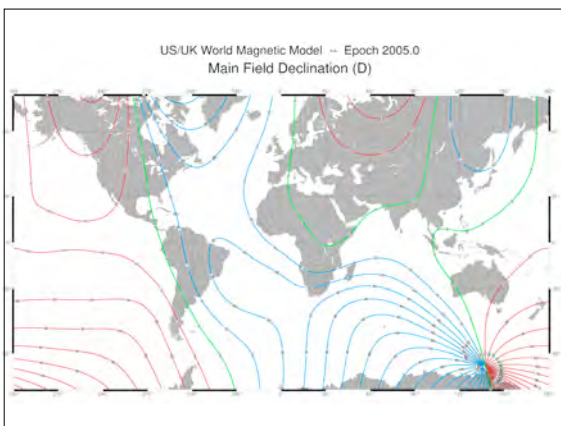
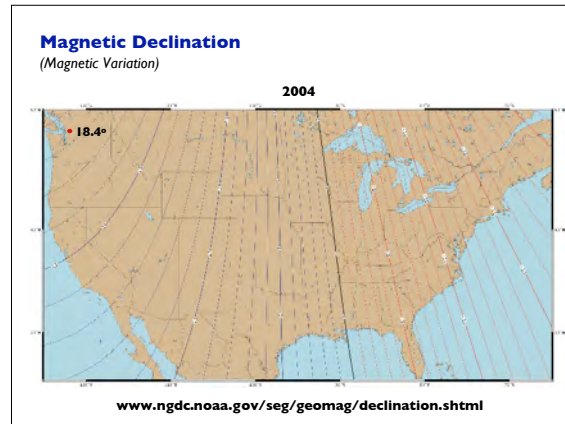
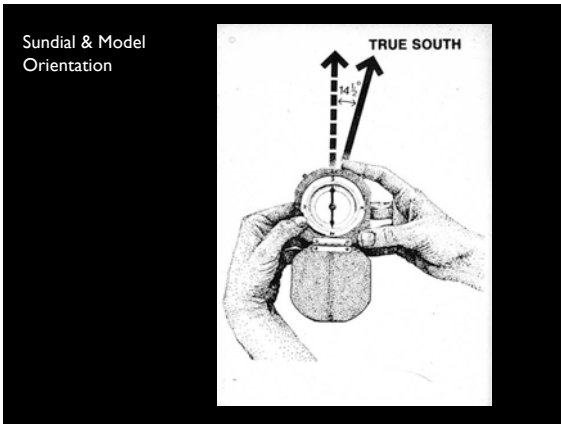
These are extraordinary structures – basically buildings and spaces as instruments of observation.



Another type of horizontal sundial uses a vertical gnomon – often called Flagpole Plots



Sunpeg sundials can be found on pgs. 323-326 in *Sun, Wind, & Light*.



Clock time vs. solar time

Solar time is unique for each location according to longitude and time of year. It is relatively straightforward to relate solar time to local standard time.

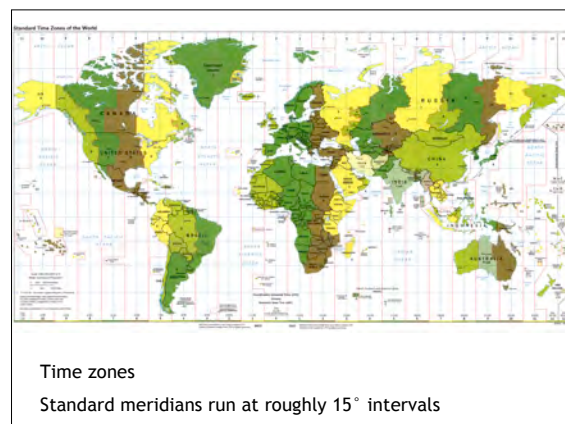
1. Standard Time vs. Daylight Savings Time
2. Longitude: distance from the standard meridian within a time zone (120°, 105°, 90°, 75°)
3. Equation of Time

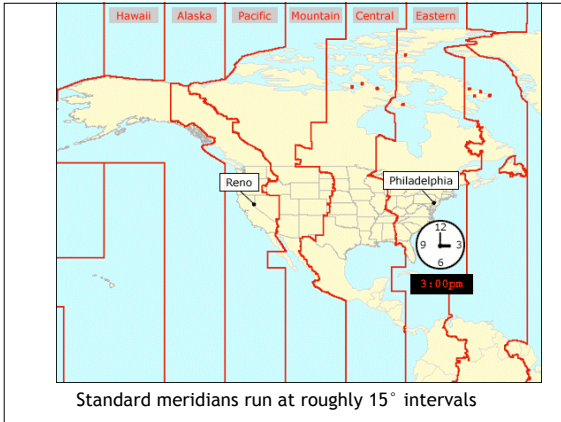
2. Longitude: distance from the standard meridian within a time zone (120°, 105°, 90°, 75°)

- Time zones = 1 hour segments

A diagram of a globe showing vertical lines representing meridians. The top is labeled 'N' and the bottom is labeled 'S'.

- $360^\circ / 24 \text{ hours} = 15^\circ / \text{hour}$ or 1 degree every 4 minutes





Is the sun always at its highest altitude at clock noon?

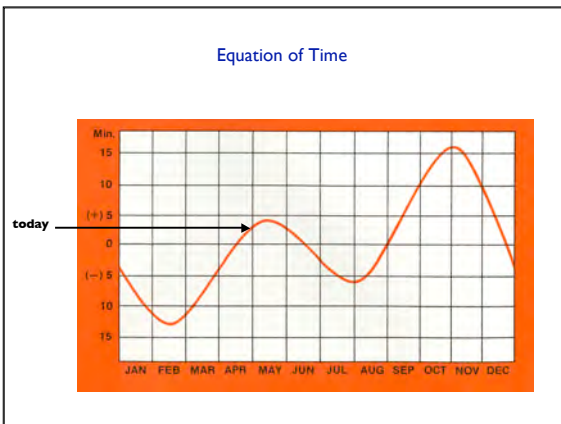
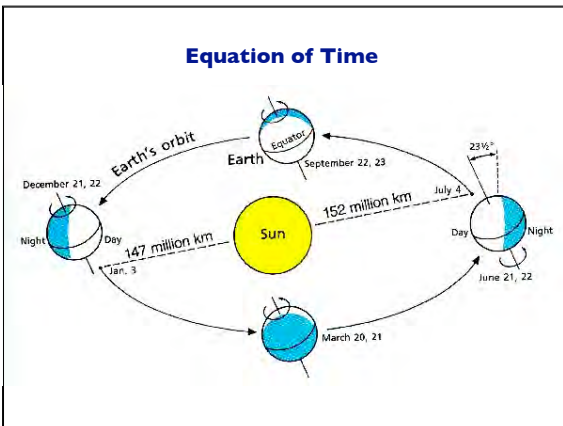
Hint: The standard meridian is 120° for Pacific Standard Time.

Pacific Standard Time datum (Standard Meridian): 120.00°
 Seattle's Longitude: 122.33°
 Our distance from the Standard Meridian: 2.33°

The earth rotates **360° every 24 hours**
 $360/24 = 15°$; the earth rotates **15° every 1 hour**
 60 minutes/15° results in **1° every 4 minutes**

$2.33° \times 4 \text{ minutes} = 9.33 \text{ minutes}$ (9 minutes 20 seconds)

The sun will reach "solar noon", the highest solar altitude for the day, at about 12:09 in Seattle (when it is noon, clock time, it is 11:51 solar time)

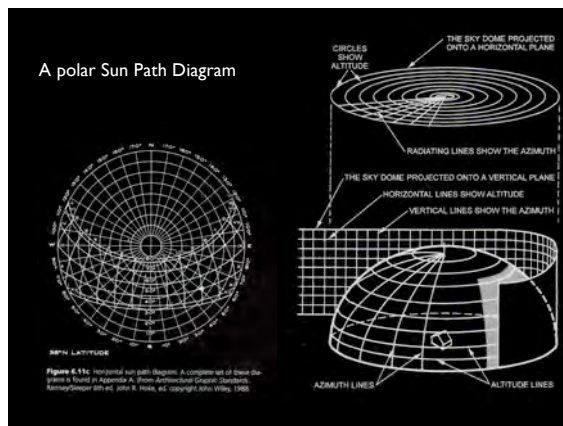
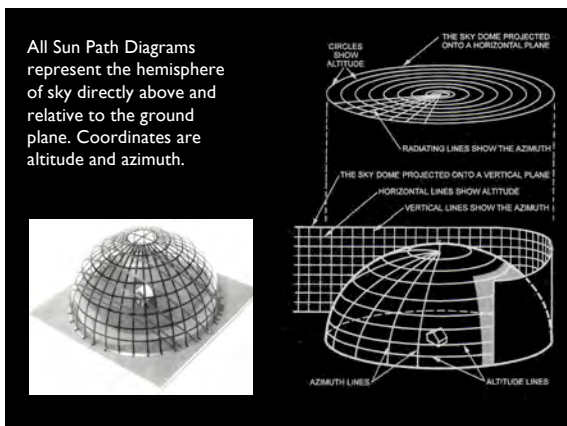
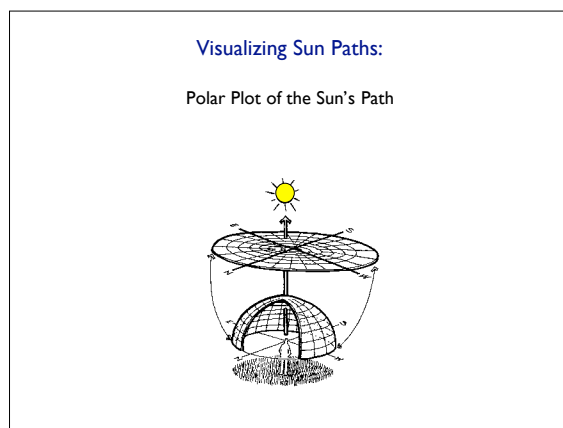
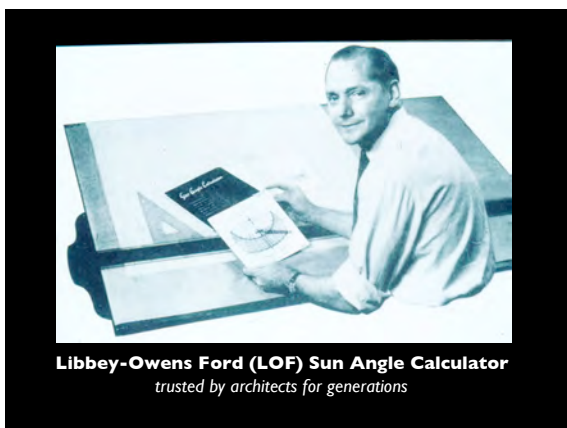
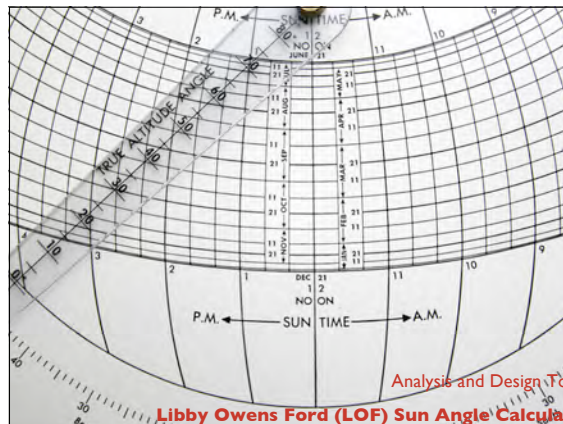
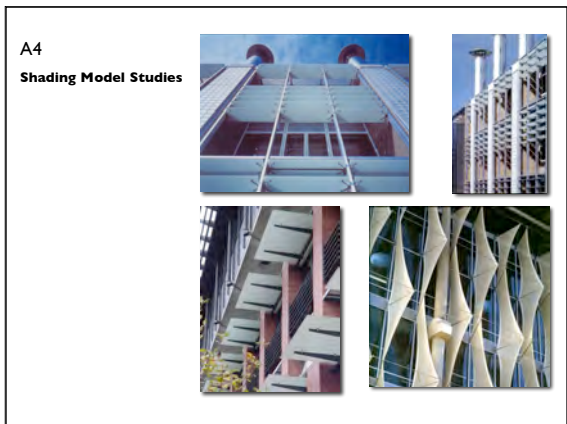


Converting Solar Time

Local solar time (LSoT) is the local clock time adjusted for these factors:

- Determine the local standard time, LST. This is clock time, adjusted for daylight savings time if necessary. If daylight savings is in effect, subtract one hour.
- Determine the local standard meridian (LSTM) and the local longitude (LL).
- Determine the equation of time, EoT, adjustment in minutes.

$$\begin{aligned} \text{LSoT} &= \text{LST} + (4 \text{ minutes} * (\text{LSTM} - \text{LL})) + \text{EoT} \\ &= 12:00 + (4 \text{ minutes} * (120 - 122.33)) + (+4) \\ &= 11:54 \end{aligned}$$



Construction of Sun Path Diagrams:

- Altitude and Azimuth
- 9 am March 21
- Additional times on March 21
- Plotting the sun for the 21st day of each month
- Hour lines (dotted) are added

Sun, Wind & Light
pgs. 297 - 300

MEEB 10th Appendix D.3
pgs. 1539-1542

Sun path diagrams combine coordinates of **time and position** and allow analysis of:

- Sun Position at any time of day and year
- Site Shading (fisheye imagery)
- Window Shading Devices

A LOF Sun Angle Calculator example:

Find the sun's position on **Jan. 21st** at **11 AM**

36° N. Latitude:
Altitude = **32°**
Azimuth = **17°**

A LOF Sun Angle Calculator example:

Find the sun's position on **Oct. 21st** at **3 PM**

36° N. Latitude:
Altitude = **26.5°**
Azimuth = **51°**

