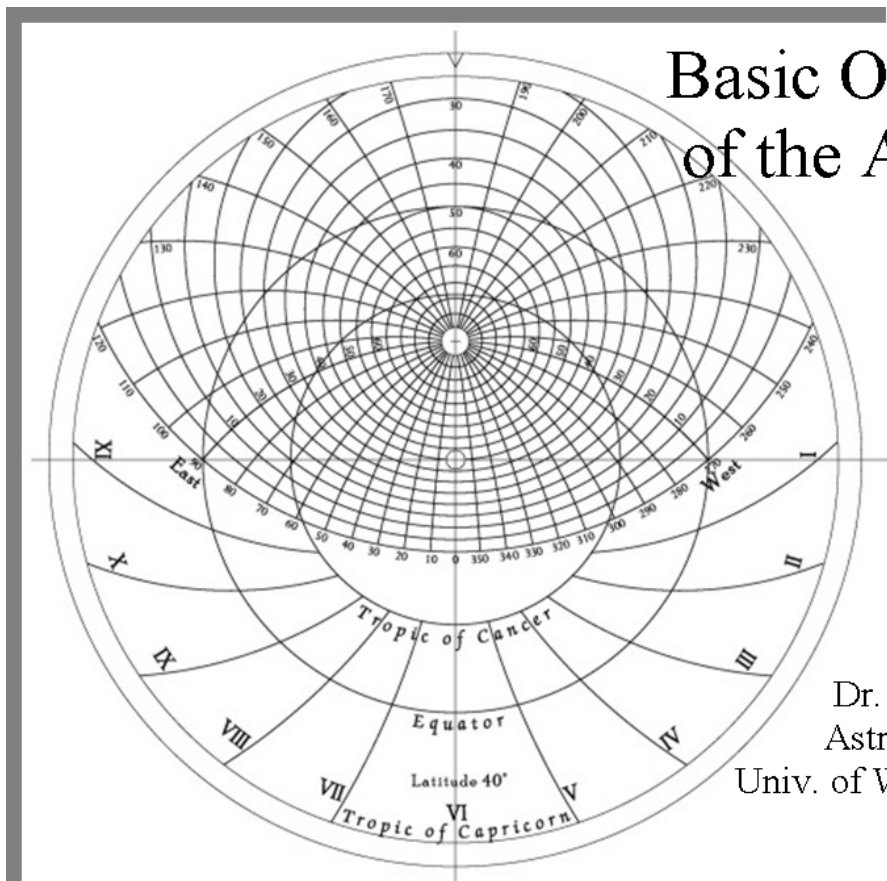


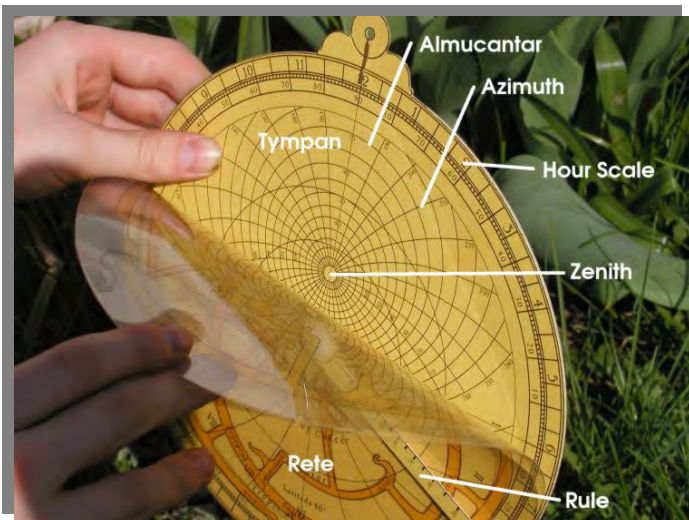
## LT-45 Astrolab Kit

### Basic Operations of the Astrolabe

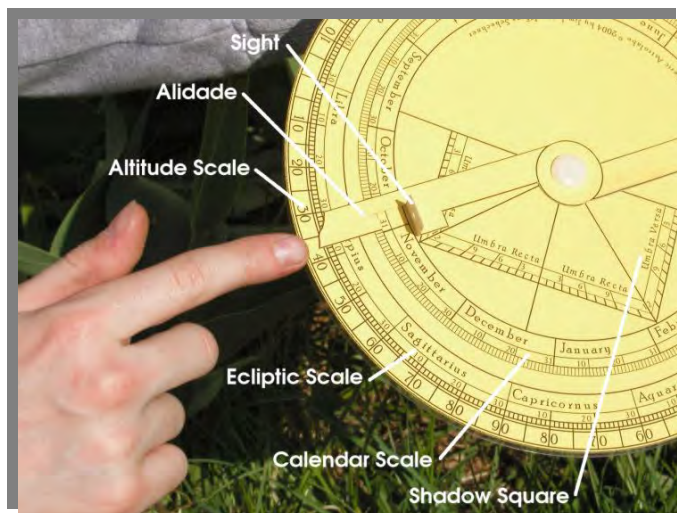


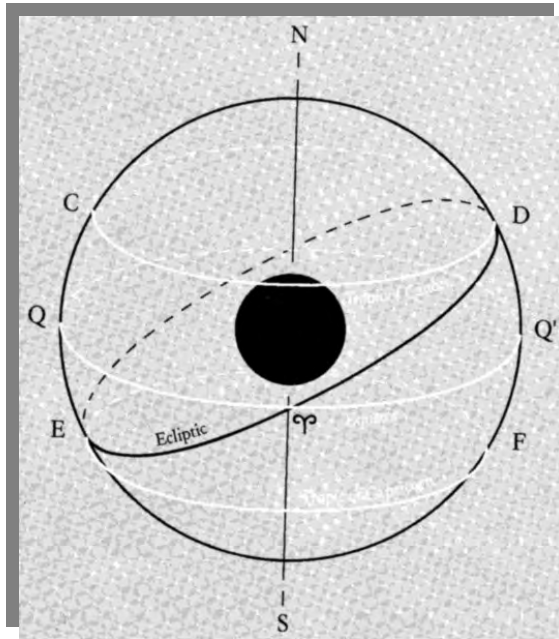
Dr. James Lattis  
Astronomy Dept.  
Univ. of Wisconsin-Madison

Parts of the Astrolabe (front)



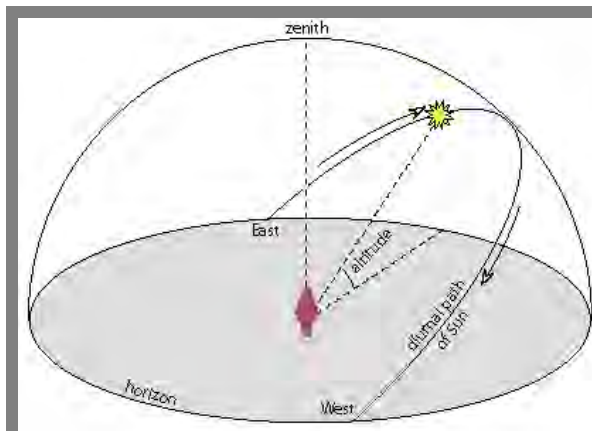
Parts of the Astrolabe (back)





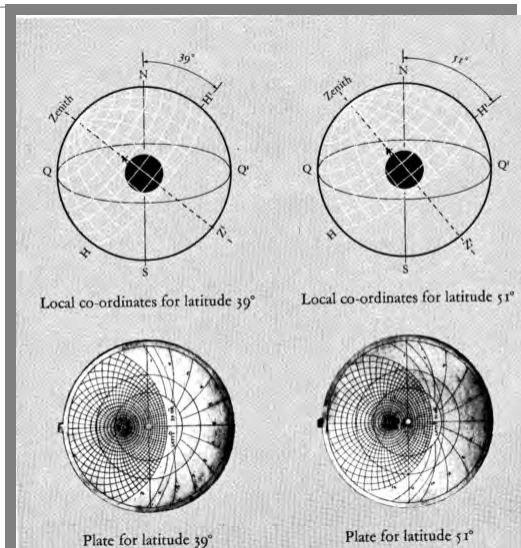
**Celestial Geometry of the Astrolabe**

- Celestial poles
- Celestial equator
- Ecliptic
- Tropics



**Geometry of the Observer**

- Horizon
- Zenith
- Cardinal points
- Azimuth
- Altitude



**Astrolabe blends both Geometries**

- Horizon
- Zenith
- Almucantars
- Azimuths

## Astrolabe Examples: Introduction

- All the examples assume the observer is on or near 40° north latitude.
- Astrolabe results are always approximate, e.g. to within a couple of degrees in position and as much as 10 to 15 minutes in time.
- Astrolabe results are local, e.g. you can find true solar time ("sundial time"), but for civil (i.e. "clock") time other corrections are needed.
- Operations with the astrolabe are either calculation, measurements, or a combination of both.

## Star calculations

Find the zenith on the tympan. Rotate the rete to find a star that passes nearly through the zenith. *What is the name of the star?*

- **Vega**

*What time does this happen on July 1?*

- **About midnight**

*Where on the horizon does the star Altair rise?*

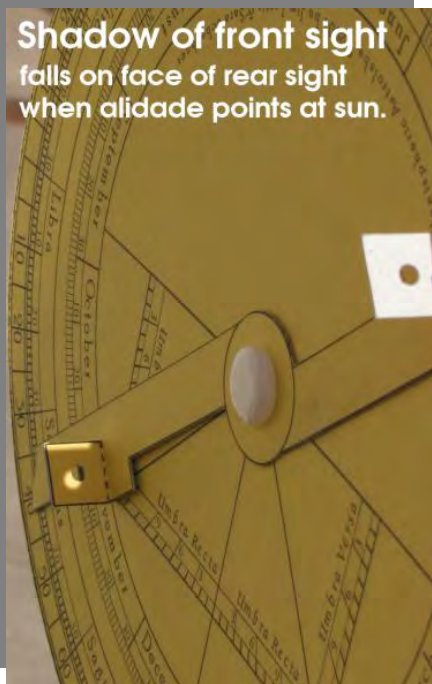
- Rotate the rete until the Altair pointer is on eastern horizon.
- Find azimuth of rising among the azimuth lines.  
**(Approx. 78°)**

*How high above the horizon is Altair at culmination?*

- Rotate the rete until the Altair pointer reaches the meridian.
- Find altitude of culmination among the almucantars.  
**(Approx. 60°)**

# Measuring Angles

Shadow of front sight falls on face of rear sight when alidade points at sun.



- Use the shadow of the alidade to measure altitude of the sun, as at left. (Never attempt to sight the sun through the alidade.)
- Measure the altitude of stars and other objects by looking through the alidade sights, as below.

Measuring altitude of distant object.



## FINDING TIME BY THE SUN



*Afternoon of April 28;  
What is the local solar time?*

1. Measure altitude of sun, as shown previously.
2. Read solar altitude from the alidade's position on the altitude scale, as at left.
3. The sun's altitude is measured to be between **37 and 38°**. Note this.

## Finding Time by the Sun, cont.



4. Next, still on the back, set the alidade to 28 April, then read the position of the sun in the ecliptic from the ecliptic scale, as at right. (**Taurus 7°**). Note this result.



5. On the front, find the 30° and 40° almucantars west of the meridian.
  6. Rotate the rete until Taurus 7° falls at approximately 37° between the almucantars.
  7. Without moving the rete, slide the rule until it crosses Taurus 7°.
  8. Read the time on the hour scale. **Result: about 3:40 P.M.**
- N.B. Remember, this is local solar time (as would be found by a sundial) *not* civil time.

### FINDING TIME BY THE STARS

#### Evening of March 19. What is the local time?

- Use the alidade and calendar scale to find that the sun is at Pisces 28°. Note Result.
- Find the altitude of a bright star, e.g. we would find Sirius at 20° above the western horizon. Note result.
- On the front, rotate the rete until Sirius pointer reaches the 20° almucantar above western horizon.
- Without moving the rete, move the rule until it crosses Pisces 28°.
- Where the rule crosses the hour scale, read the time on the hour scale. (10 P.M.)

### SUNRISE CALCULATION

#### March 19. Where along the eastern horizon does the sun rise?

- On back, find position of sun in ecliptic. (Pisces 28)
- On front, rotate rete until Pisces 28 crosses eastern horizon (ie the 0° almucantar)
- Azimuth is position of sunrise. (90° i.e. due East)

#### What time is sunrise?

- Rotate rule to cross Pisces 28. Read time on hour scale. (6 A.M.)

### ALTITUDE OF SUN

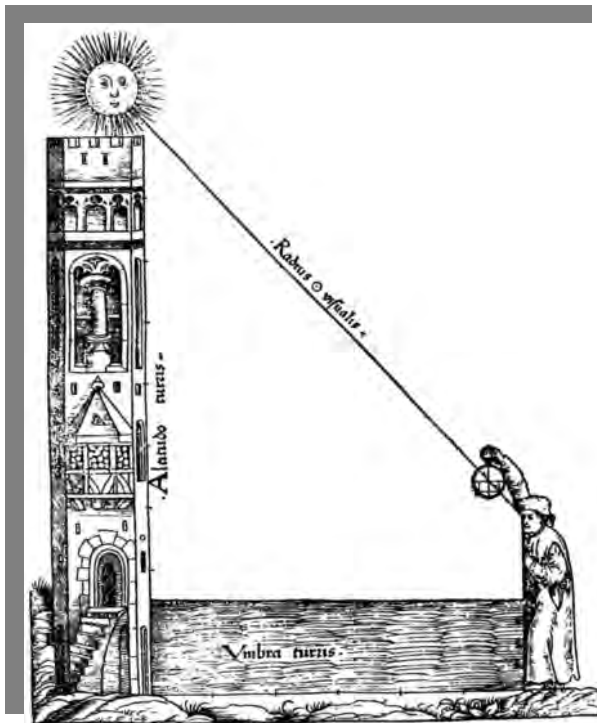
#### March 19. What is the noon altitude of the sun?

- Find position of Sun in ecliptic. (Pisces 28)
- Rotate rete until position of sun crosses souther meridian.
- Read altitude of crossing point from almucantars. (50°)

### OBSERVER'S LATITUDE

Use alidade to measure altitude of North Star.

Altitude of North Star is (nearly) the same as observer's latitude.



*My neighbor's fortress is 100 yards away. How tall is the building?*

- Measure angle to top of tower. (say 33°)
- In shadow box, alidade crosses 9. 9 is 3/4 of 12; 3/4 of 100 is 75; so height of tower is 75 yards plus the height of my eye.