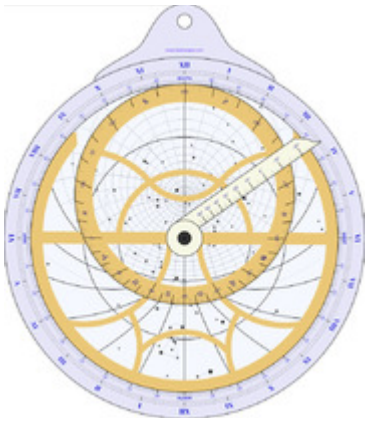
Technology Astrolabe: An instrument with a past and a future

Front

Back



The astrolabe is a very ancient astronomical computer for solving problems relating to time and the position of the Sun and stars in the sky. Several types of astrolabes have been made. By far the most popular one is when the celestial sphere is projected onto the plane of the equator. A typical old astrolabe was made of brass and was about 6 inches (15 cm) in diameter, although much larger and smaller ones were made.

The astrolabe is the technology used to show how the sky looks at a specific place at a given time. This is done by drawing the sky on the face of the astrolabe and marking it so positions in the sky are easy to find. To use an astrolabe, you adjust the moveable **components** to a specific date and time. Once set, much of the sky, both visible and invisible, is represented on the face of the instrument. This allows a great many astronomical problems to be solved in a very visual way.

Typical uses of the astrolabe include finding the time during the day or night, finding the time of a celestial event such as sunrise or sunset and as a handy reference of celestial positions. Astrolabes were also one of the basic astronomy education tools in the late Middle Ages. Old instruments were also used for astrological purposes. The typical astrolabe was not a navigational instrument although an instrument called the ***mariner's astrolabe*** was widely used in the Renaissance. The mariner's astrolabe is simply a ring marked in degrees for measuring celestial altitudes.

The **history of the astrolabe** technology begins more than two thousand years ago. The credit for the invention of the earliest astrolabe goes to Hipparchus, (200-150 B.C.) who created an astrolabe in its crudest form but gave the world an important mechanism to understand the celestial sphere more accurately. True astrolabes were made before A.D. 400. The astrolabe was highly developed in the Islamic world by 800 and was introduced to Europe from Islamic Spain (al-Andalus) in the early 12th century. It was the most popular astronomical instrument until about 1650, when it was replaced by more specialized and accurate instruments.

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Adapted from: http://www.astrolabes.org/pages/uses.htm (free download)and
http://www.brighthub.com/science/space/articles/61397.aspx

Use of the Astrolabe

In the 10th century, Abd al-Rahmân b. Umar al-Sufī (d. A.H. 376/A.D. 986-7) wrote a detailed essay on the astrolabe consisting of 386 chapters in which he described 1000 uses for the astrolabe. He perhaps overstated the flexibility of the astrolabe, but astrolabes can be used to solve many astronomical problems that would otherwise require rather sophisticated math.

All of the everyday uses of the astrolabe are not known, but they were certainly used to tell time during the day or night, to find the time of sunrise and sunset and, thus, the length of the day, to locate celestial objects in the sky, as a handy reference of celestial positions and, as astrology was a deeply embedded element of the cultures that used astrolabes, to determine aspects of horoscopes. Islamic prayer times are astronomically determined, and the astrolabe could be used to determine the required times. Astrolabes, can be used with modern civil time.

Finding the Time of Day

The time of day is found in the following steps:

1. The altitude of the Sun or a bright star is determined using the back of the instrument. The astrolabe is held above eye level from the suspension. The astrolabe is oriented so the Sun or star is lined up with the back of the astrolabe. The alidade is rotated until the Sun's shadow or the star itself is visible through the sights on the alidade. The altitude is noted from the altitude scale on the back of the instrument.
2. The Sun's position on the ecliptic is found by setting the alidade on the date and reading the Sun's longitude on the zodiac scale.
3. On the front of the astrolabe, the rule is rotated until is crosses the ecliptic at the Sun's current longitude. The point where the rule crosses the ecliptic is the Sun's current position.
4. The rete and rule are rotated together until the Sun or star pointer is at the measured altitude.
5. The rule points to the apparent solar time on the limb. Apparent solar time is the time as shown on a sundial and is different for each longitude. In modern use, apparent solar time must be corrected to zone time by compensating for the equation of time and the difference in longitude from the center of the time zone. The appropriate scales for this correction are on the back of the Modern Edition of **The Personal Astrolabe**.

It should also be noted that in the Middle Ages the time of day was usually expressed as the part of the day or night that had passed. That is, sunrise was the beginning of the 1st hour of the day, noon was the end of the 6th hour and sunset was the end of the 12th hour of the day and the beginning of the 1st hour of the night. The length of the hour changed during the year with the amount of change depending on the latitude. An "hour" was longer in the summer than in the winter. These hours are called, "Unequal Hours" and many astrolabes had curves on the plate for determining the unequal hour of the day or night. The use of unequal hours for civil time keeping gradually declined as reliable clocks and watches became available in the 17th and 18th centuries although their use continued in parts of the world well into the 19th century.