

The Astrolabe

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Resource Overview

15-16 years





Name.....

The Astrolabe: A Journey Through Science & Arabic Heritage

For centuries, people have looked up at the stars to understand time, location, and direction. One of the most fascinating inventions that helped them in this quest was the astrolabe. This intricate device was perfected by Arabic and Muslim scholars and became one of the most important scientific tools of the Islamic Golden Age. It played a crucial role in navigation, astronomy, and even in calculating prayer times. The astrolabe not only helped travelers explore new lands but also deepened humanity's understanding of the universe.

What is an Astrolabe?

An astrolabe is an ancient scientific instrument that functioned like an early computer. It was used by astronomers, sailors, and scholars to calculate time, measure the height of objects, and determine location by tracking the positions of the sun and stars. The word "astrolabe" comes from the Greek term *Astrolabos*, meaning "star finder." However, in the Islamic world, it was more commonly referred to as *Asturlab*.





How Did It Work?

The astrolabe was an essential tool for travelers, sailors, and scientists long before GPS and modern navigation systems. It consisted of a series of spinning dials, a flat circular plate, and a rotating ruler-like arm called the alidade. By aligning the astrolabe with the sun or specific stars, users could perform complex calculations to determine their latitude, the time of day, and even the best times for religious observances. This made it especially valuable for Muslim scholars who used it to calculate prayer times and the direction of Mecca.

Why Was It Important?

During the Islamic Golden Age, scholars in the Middle East and North Africa improved the design and function of the astrolabe, transforming it into one of the most advanced scientific instruments of its time. It allowed explorers to navigate vast deserts and open seas with greater accuracy, helping to expand trade and cultural exchange between different parts of the world. The astrolabe also played a crucial role in the study of astronomy, laying the groundwork for future scientific discoveries.

Although modern technology has replaced the astrolabe in everyday use, its legacy lives on. It represents a remarkable period in history when science and culture thrived, demonstrating the ingenuity of Arabic and Muslim scholars. Today, astrolabes can be found in museums and libraries, serving as a reminder of how people in the past combined knowledge, mathematics, and observation to explore the world around them.

The Origins of the Astrolabe: Who Invented It?

The astrolabe has a long and fascinating history that dates back to the ancient Greeks around **Hijri 200 BH (150 BCE)**. A Greek astronomer named **Hipparchus** first developed the idea of mapping the sky onto a flat surface using a technique called **stereographic projection**. This method allowed astronomers to track the movement of the stars and planets. However, it was the scholars of the **Islamic Golden Age** who perfected the astrolabe, improving its accuracy and making it easier to use. One of the oldest surviving



astrolabes was made in the **4th Century Hijri (10th century CE)**, demonstrating how valuable and advanced these instruments became over time.

The astrolabe has been used for over **2,500 years**, proving to be an essential tool before the invention of modern clocks and navigation systems. Some key moments in its history include:

- **Hijri 200 BH (150 BCE):** Hipparchus developed the first astrolabe concept using stereographic projection.
- Hijri 200-400 AH (2nd-5th Century CE): Greek and Roman scholars improved its design, but it was still not widely used.
- Hijri 100-400 AH (8th-10th Century CE): During the Islamic Golden Age, scholars such as Al-Farghani (9th Century CE) and Al-Zarqali (11th Century CE) refined the astrolabe, making it more practical and accurate.
- Hijri 800-1100 AH (15th-17th Century CE): Astrolabes became crucial for Muslim navigators, European explorers, and scientists studying astronomy and guiding ships across the seas.

***** How Was the Astrolabe Used?

Astrolabes were one of the most important tools from our past. They were used in different ways depending on who was using them.

Navigation – Sailors used the astrolabe to find their latitude at sea. By measuring the height of the sun or a star above the horizon, they could determine their position on Earth.

Timekeeping – Scholars used astrolabes to calculate the time of day or night by aligning it with the stars or the sun. This was especially useful before modern clocks were invented.

Islamic Prayer – People used astrolabes to find the Qibla (direction of Mecca) and determine the exact times for prayer.

Astronomy – Scientists used astrolabes to study the movement of planets and stars. They helped astronomers track celestial objects and create detailed star maps.



🔆 The Key Parts of an Astrolabe

Astrolabes are made up of several parts, each with a special job. Understanding these parts helps us see how the astrolabe worked:

• Mater (Main Body) – The large circular frame that holds all the other parts.



• **Rete** (*Star Map*) – A rotating metal framework with pointers for bright stars.





• Alidade (Sighting Ruler) – A movable arm used to measure angles of the sun and stars.



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• **Plates** – Different plates were used for different latitudes, allowing the astrolabe to be accurate in different places.









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X Types of Astrolabes

Over time, different types of astrolabes were created for different purposes. Some of the most well-known include:

1 Planispheric Astrolabe – The most common type, used for solving astronomical problems related to time and position.



2 Mariner's Astrolabe – Designed for sailors to measure latitude while at sea.



3 Universal Astrolabe – Developed in Muslim Spain (11th century), it could be used anywhere, unlike earlier astrolabes which required different latitude plates.





(4)Spherical Astrolabe – A rare form of the astrolabe that was three-dimensional.



5 Quadrant Astrolabe – A simplified version that uses only a quarter of a circle.





% Makers of Astrolabes

Throughout history, many skilled artisans and craftsmen created **beautifully designed** and highly functional astrolabes. These instruments were often engraved with Arabic calligraphy and intricate geometric patterns, reflecting the artistic and scientific achievements of their makers.

🏺 Notable Makers of Astrolabes

Muhammad ibn Abi Bakr al-Farisi (7th Century AH / 13th Century CE) – A Persian craftsman who made astrolabes with detailed celestial charts.

We ustadh Ali ibn Umar al-Attar (8th Century AH / 14th Century CE) – A well-known astrolabe maker from Cairo, Egypt, who created intricate brass astrolabes for scholars and navigators.

* Ahmad ibn Muhammad al-Sarraj (9th Century AH / 15th Century CE) – A famous astrolabe maker from the Islamic world, known for his precise and highly decorative instruments.

Mariam Al-Ijliya (4th Century AH / 10th Century CE) – One of the few known female astrolabe makers, who studied under her father in Aleppo and gained recognition for her expertise.

The **Islamic Golden Age** was a time of great scientific discoveries. Many Muslim scholars helped improve the astrolabe. Some of the most famous include. Many Muslim scholars and inventors played a key role in perfecting and using the astrolabe. Some of the most famous include:

Al-Farghani (3rd Century AH / 9th Century CE) – Wrote about how astrolabes worked and improved their accuracy.

K Al-Zarqali (5th Century AH / 11th Century CE) – Created a universal astrolabe that could be used anywhere in the world.

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📡 The Astrolabe and Modern Science

The astrolabe was one of the most advanced scientific tools of its time. It inspired many modern inventions that we use today, including:

GPS (Global Positioning System – Just like sailors used astrolabes for navigation, we now use GPS to find our location anywhere on Earth.

Clocks and Timekeeping – The way the astrolabe calculated time helped develop the technology used in modern clocks.



Telescopes and Astronomy – The study of the stars with astrolabes helped scientists understand space, leading to the invention of telescopes.

🤩 Important Fact!

Did you know? Some astrolabes were as small as a pocket watch , while others were huge and hung in mosques and palaces to track time and stars. The largest astrolabes ever made were over 1 meter wide!



The following resources provide more information on the history and science of astrolabes:

- King, David A. In Synchrony with the Heavens: Studies in Astronomical Timekeeping and Instrumentation in Medieval Islamic Civilization (2004).
- Saliba, George. A History of Arabic Astronomy: Planetary Theories During the Golden Age of Islam (1994).

• Hogendijk, Jan P., & Brentjes, Sonja. *Studies on the Transmission of Medieval Mathematical Astronomy* (2020).

- Qatar National Library Archive: <u>QNL Online Astrolabe Resources</u>
- 1001 Inventions: <u>History of Astrolabes</u>