



Mathematical models: from sundials to number engines

Reading the sky with the astrolabe

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The Greeks were concerned with modelling the heavens. With providing a model which would be an overall view. An integrated view of how the heavens worked. So what's remarkable about the phenomenon of Greek astronomy is distancing. That getting outside and representing the whole as an integrated model. And the astrolabe it was really just a material version of that conceptual leap.

Narrator

To start with, the model was all in the mind. An imaginary view from space of the earth and the stars beyond. In their heads the Greek's pictured the circles made by the Equator. And the tropics of Cancer and Capricorn. And imagined how they'd look to an observer, suspended below the South Pole. Using the method of stereoscopic projection, they converted their mental model from 3 dimensions to just 2. The technique uses the angles of the lines linking the eye to the edges of each circle. If they angles are kept the same but the lines are extended or shortened, the result is three so-called celestial circles, projected on the flat equatorial plane. The Greeks and later the Arabs made this mental image real, by engraving the celestial circles onto brass. They also marked a grid of the local coordinates. Lines converging from the observer's horizon and circles joining equal heights from horizontal to 90 degrees. The grid represents all of the sky that's visible to the observer.

The Rete is a map of the heavens, projected into the equatorial plane. It enables the astrolabe to model the movement of the stars across the night sky. From star rise to star set.

Here, the star Aquila appears over the observer's horizon. It moves in an arc, up and across the sky. Until it reaches its maximum altitude or zenith. As the night wears on, Aquila decreases in altitude until it finally sets below the horizon.

Navigators and astronomers soon found uses for these heavenly movements, modelled in the brass astrolabe.

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This is a calculating device, which allows you to produce instrumental results for astronomical calculations, which would have been very long and tedious. There is also the conceptual aspect of being able to hold the cosmos in your hands, and to be able to see how the various movements are related to each other.