Islamic Mathematics 2

During the 8th and 9th centuries AD, the Islamic world spread along the northern coast of Africa and up into southern Spain and Italy. The next three centuries were fertile years for the development of mathematics and astronomy. The Islamic astronomers began to use the astronomical and navigational instruments of the day, such as the **planisphere**, for observing the positions and altitudes of celestial bodies and telling the time of day, and they also used the planisphere's cousin, the astrolabe.

Cordoba became the capital of Moslem Spain, with Abd al-Rahman as Emir. During the next few centuries, Moslem architecture became widespread throughout southern Spain

and Portugal. Celebrated examples include the magnificent arches in the **Cordoba mosque** and the variety of **tilings** in the Alhambra in Grenada.

The Spanish geometer and astronomer **al-Zarqali** (d. 1100) lived in Toledo and Cordoba and produced a number of important works, including a set of trigonometrical tables, chiefly for use in astronomy. An instrument maker, he constructed a number of astrolabes, including the azophea depicted here.

The Persian astronomer **Jamshid al-Kashani** or **al-Kashi** (d. 1429) made extensive calculations with decimal fractions and established a notation for them, using a vertical line to separate the integer and fractional parts. A prodigious calculator, he determined π to 16 decimal places and obtained a very precise value for $\sin 1^\circ$.

Al-Kashani's patron, **Ulugh Beg** (1394–1449) was a Turkish astronomer in Samarkand in central Asia; his observatory contained a 130-foot sextant, mounted outdoors in a trench. Using al-Kashani's value for $\sin 1^\circ$, Ulugh Beg constructed extensive trigonometrical tables for the sine and tangent of every angle for each minute of arc to 5 sexagesimal places.

Planisphere

Cordoba mosque

Islamic tiling

Al-Zarqali

Al-Kashani

Ulugh Beg's observatory

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