Heavenly Lines

JavaScript-Generated Astrolabes for
Celestial Navigation on Faraway Worlds

An astrolabe is a sophisticated instrument used to measure the altitude of celestial bodies above the horizon. Serving across Classical Antiquity, the Islamic Golden Age, the European Middle Ages, and the Age of Discovery as an analog calculator for identifying stars and planets, determining local latitude from time (and vice versa), and performing surveying and triangulation, it functioned as both an observational tool and a computational device.

The first universal astrolabe was invented by Abu Ishaq Ibrahim al-Zarqali (b. 1029). His "Tablet of al-Zarqālī" employed an innovative projection method that mapped celestial coordinates onto a plane perpendicular to the equator at the solstice points, eliminating the need for multiple latitude-specific plates that traditional astrolabes required, making the instrument functional at any latitude. Known in Europe as “Saphea Azarchelis,” it entered university curricula by the 15th century.

Trained as a metalsmith, al-Zarqālī refined trigonometric tables, calculated the ecliptic's obliquity, and advanced stereographic projections. His observations of Mercury's motion led him to propose an oval-shaped orbit, a significant departure from the perfect circles assumed in Ptolemaic astronomy. The astronomer Copernicus cited him centuries later in "De Revolutionibus," and Chaucer referenced al-Zarqālī among the astrolabe's notable practitioners.

Inspired by al-Zarqālī, I sketched astrolabes for eighteen celestial bodies, applying NASA data to capture variations in axial tilt, orbital period, and rotational period. Initiated during my MIT Fellowship in the course “Recreate Experiments from History,” the digital artifacts were drawn in p5.js, a JavaScript library for creative coding, and exhibited in MIT's Wiesner Student Art Gallery.

This exploration demonstrates how astrolabes can provide navigational and temporal orientation beyond Earth, offering both a tribute to al-Zarqālī's enduring ingenuity and a computational tool for future interplanetary travel.

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Available for exhibition, publication, and collaboration.