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Discovery of the Lost Star Catalog of Hipparchus on the Farnese Atlas

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Hipparchus was the greatest astronomer in Antiquity, with part of his reputation being based on his creation of the first star catalog around 129 BC. His star catalog has been since lost, although a few partial star positions are recorded in his only surviving work, the Commentary. Independently, a late Roman statue called the Farnese Atlas (now in Naples) has been known since the Middle Ages which records ancient Greek constellations. This marble statue shows the Titan Atlas kneeling on one knee while hold a large globe (65 cm in diameter) on one shoulder. This globe records 41 constellations accurately placed against a grid of reference circles, including the equator, tropics, colures, Arctic circle, and Antarctic circle. As the constellation positions shift over time (due to precession as discovered by Hipparchus), the position of the constellations on the Titan's globe will reveal the date of observations as ultimately used by the sculptor. Prior brief work on the globe has resulted in dates spread out over six centuries, with recent reviews only concluding that a thorough study is desperately needed. To fill this need, I have taken photographs appropriate for photogrammetry and have measured the positions of 70 points in the constellation figures and transformed these into RA and DEC in the globe's reference frame. A chi-square analysis then shows the date of the constellations to be 125 BC with a one-sigma uncertainty of 55 years. This date points directly at Hipparchus as being the observer and it strongly excludes all candidates that have been proposed over the past century (Aratus at c. 275 BC, Eudoxus at c. 366 BC, the original Assyrian observer at c. 1130 BC, and Ptolemy at AD 128). In addition, a very detailed comparison of the constellation figures and symbols on the Atlas' globe has been made with Hipparchus' Commentary, Aratus' (and Eudoxus') Phaenomena, Eratosthenes' Catasterismi, and Ptolemy's Almagest. I find essentially perfect agreement with Hipparchus' description of the sky (including many points unique to Hipparchus) with the Farnese Atlas; while all other ancient sources have many significant differences. In all, I have the very confident conclusion that the constellation figures on the Farnese Atlas are a depiction of Hipparchus' lost star catalog.