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Comet P/Swift-Tuttle: Its orbital motion from 703 BC to AD 2392

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We have performed an investigation of the orbit of P/Swift-Tuttle via a long-term integration forward to AD 2392 and backward to 703 BC. The initial conditions for the integration are determined from observations obtained at the 1992-93, 1862 and 1737 returns. Perturbations due to the nine planets have been fully taken into account. The coordinates of the planets are taken directly from the JPL long ephemeris DE102. The integrator itself is a predictor-corrector based on a Gauss-Jackson procedure. Our successful integration has enabled us to identify with certainty two of its previous apparitions in AD 188 and 69 BC from the ancient Chinese observations. No other early observations of P/Swift-Tuttle have been found. The unobserved returns between AD 188 and 1737 can easily be explained by the large minimum distance between the comet and the Earth which prevented naked eye visibility. We find that the comet must achieve a visual magnitude 3.4 to be discovered. The observing conditions at each return computed from the osculating orbital elements resulting from our integration suggest that the comet has maintained about the same intrinsic brightness for more than two millennia. Our forward integration puts the comet 0.153 AU away from the Earth at closest approach during its next return in 2126. Thus, there is no immediate chance of a collision with the Earth.

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