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Celestial Mechanics as Applied Mathematics

Celestial Mechanics, the study of the motion of heavenly bodies (the Sun, Moon and planets), is perhaps the oldest exact science and has long been subject to large demands of precision and involved intricate calculations. In turn celestial mechanics has been the starting point of important developments in mathematics, such as Poincaré's studies on quasi-periodic orbits, which demonstrated the complex unpredictability of physical systems. In trying to arrive at a more accurate Lunar theory in the 1960s and 70s astronomer Wallace Eckert argued that his new solution (set of equations) for the Moon's orbit would test the limits of the convergence of series. Charles Delauney's wholly algebraic solution for the motion of the Moon served as a test bed for computer algebra systems in the 1970s. In this talk I will discuss this relationship between celestial mechanics and mathematics; how the careful tracking of empirical terms in celestial mechanics has implications for the conceptual realm of mathematics.