

## Mathematics and Astronomy Kepler's Laws of Planetary Motion



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**Digital Visualization Theatre**  
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In the early 1600's, the German mathematician-astronomer Johannes Kepler analyzed the volumes of astronomical data recorded to that day in an attempt to discover mathematical laws governing the motion of the planets. After nearly a decade of work, building on the ideas of Galileo, Copernicus, and others, he proposed two empirical laws concerning the motion of the planets. Nearly three quarters of a century later, the Calculus was used to deduce these laws of motion as a consequence of Sir Isaac Newton's theory of gravity, permanently cementing the bond between mathematics and physics. This presentation will use the unique features of the digital visualization theater to illustrate how geometry is used by astronomers to make precise observations of the night sky, allowing us to bring mathematics to bear on the study of this aspect of nature. We will then follow Kepler's empirical analysis which led to his laws of motion, often celebrated as one of the greatest pieces of retroductive reasoning ever performed.