Space-Time Encyclopedia Article

Space-Time

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Space-Time

Space-time is the coordinate system used to describe the universe. The simplest physical view of space-time, and the one most commonly used, is four-dimensional, assuming three dimensions of **space** and one of time. Other modern models **postulate** a larger number of dimensions unperceived by humans in their daily lives. Ten, eleven, and twenty-six are the numbers of dimensions used in some popular but as yet unprovable theories, such as superstring theory.

Until **Albert Einstein** formulated his theory of relativity in the early part of the twentieth century, the term space-time was almost never used. Spatial dimensions and time were thought to be independent and wholly separable. While the **equations** for a particle's spatial attributes often depended upon time, time itself was thought to be a great constant, passing at apparently equal rates for all observers. Since the codification and testing of relativity, however, it is known that the apparent passage of time is not constant and varies with the speed of the observer. Time and the three spatial dimensions are inextricably related.

Relativity also allows for the possibility—indeed, the certainty—that space-time is non-Euclidean (see **non-Euclidean geometries**). One of its major postulates is that mass is equivalent to energy, and that this composite mass-energy warps space-time. In some regions, then, space-time will be warped like a saddle; in other regions, like a **sphere**, depending upon the distribution of mass. The most common image of warped space-time used for visualization purposes is a series of masses on a sheet of rubber, spandex, or some other stretchy surface. The total **geometry** of space-time is as yet unknown, although it is very close to "flat" on the average. The exact geometry of space-time should be of continuing interest in years and decades to come, as it will determine the ultimate end of the universe.