# Topic Page: dark matter

Definition: **Dark matter** from *Brewer's Dictionary of Modern Phrase and Fable*

A term used by astronomers for material that has not been directly detected but whose existence is postulated to account for the motions of stars and galaxies. It is thought that some 90 per cent of the mass in the universe resides in some form of dark matter.

Summary Article: **dark matter**
From *The Columbia Encyclopedia*

material that is believed to make up nearly 27% of the mass of the universe but is not readily visible because it neither emits nor reflects electromagnetic radiation, such as light or radio signals. Its existence would explain gravitational anomalies seen in the motion and distribution of galaxies. Dark matter can be detected only indirectly, e.g., through the bending of light rays from distant stars by its gravity.

Dark matter may consist of dust, planets, intergalactic gas formed of ordinary matter, or of MACHOs [*M*assive *A*strophysical *C*ompact *H*alo *O*bjects], nonluminous bodies such as burned-out stars, black holes, and brown dwarfs; these are the so-called hot dark matter and would be dispersed uniformly throughout the universe. The discovery in 2001 of a large concentration of white dwarf stars in the halo surrounding the Milky Way indicates that these burned-out stars could represent as much as a third of the dark matter in the universe.

Other theories hold that it is made of elementary particles that played a key role in the formation of the universe, possibly the low-mass neutrino or theoretical particles called axions and WIMPs [*W*eakly *I*nteracting *M*assive *P*articles]; these are the so-called cold dark matter and would be found in clumps throughout the universe. In 1996 a Japanese team at the Univ. of Tokyo led by Yasushi Ikebe reported on dark-matter clumping in the galactic cluster Fornax. Clumps were found in two distinct regions: around a massive galaxy in the center of the cluster and, in larger amounts, around the entire cluster. This suggests that the slower, cold dark matter might form the smaller clumps associated with the galaxy while the faster, hot dark matter might form the larger clumps associated with the galactic cluster.

Computer simulations of the formation of the universe favored the cold dark matter but tended to predict the formation of too many dwarf galaxies when compared to the observed universe. This led to the postulation of warm dark matter, which resolved the simulation problems. Unlike cold dark matter, which has mass but virtually no velocity or temperature, or hot dark matter, which has mass and is highly energetic, warm dark matter has mass and a low temperature corresponding to an extremely low velocity.

See also dark energy; interstellar matter.


See Morris, R. , Cosmic Questions: Galactic Halos, Cold Dark Matter and the End of Time (1995);.

Van Flandern, T. , Dark Matter, Missing Planets, and New Comets (2d ed. 1998);.

Hawkins, M. , Hunting Down the Universe: The Missing Mass, Primordial Black Holes and Other Dark Matters (1999).

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## Harvard

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