**Steady state theory**

In cosmology, the steady state theory is a model developed in 1949 by Fred Hoyle, Thomas Gold and others as an alternative to the Big Bang theory. Although the model had a large number of supporters among cosmologists in the 1950s and 1960s, the number of supporters decreased markedly in the late 1960s and today it is considered a non-standard cosmology. It is also the basis for another theory known as the quasi-steady state theory which postulates a lot of little big bangs occurring over time. The steady state theory was developed as a result of theoretical calculations that showed that a static universe was impossible under general relativity and observations by Edwin Hubble that the universe was expanding. The steady state theory asserts that although the universe is expanding, it nevertheless does not change its look over time. For this to work, new matter must be formed to keep the density equal over time.

Because only very little matter needs to be formed, roughly a few hundred atoms of hydrogen in the Milky Way Galaxy each year, it is not a problem of the theory that the forming of matter is not observed directly. Despite violating conservation of mass, the steady state theory had a number of attractive features. Most notably, the theory removes the need for the universe to have a beginning.

Problems with the steady-state theory began to emerge in the late 1960s, when observations apparently supported the idea that the universe was in fact changing: quasars and radio galaxies were found only at large distances (i.e., redshift, and thus, because of the finiteness of the speed of light, in the past) not in closer galaxies. Halton Arp, also since the 1960s, has been taking a different view of the data, claiming that evidence can also point to quasars existing as close as the local Virgo cluster.

For most cosmologists, the refutation of the steady-state theory came with the discovery of the cosmic background radiation in 1965, which was predicted by the big bang theory. Within the steady state theory this background radiation is the result of light from ancient stars which has been scattered by galactic dust. However, this explanation has been unconvincing to most cosmologists as the cosmic microwave background is very smooth, making it difficult to explain how it arose from point sources, and the microwave background shows no evidence of features such as polarization which are normally associated with scattering. Furthermore, its spectrum is so close to that of an ideal black body that it could hardly be formed by the superposition of contributions from dust clumps at different temperatures as well as at different redshifts.

As of 2005, the big bang theory is the one that the majority of astronomers consider the best approximation to describing the origin of the universe. In most astrophysical publications, the big bang is implicitly accepted and is used as the basis of more complete theories. At the same time, after the unexpected observation of an accelerating universe in the late-1990s, there were efforts to develop quasi-steady state theories, in which there is not a single big bang but rather multiple big bangs over time which create matter.