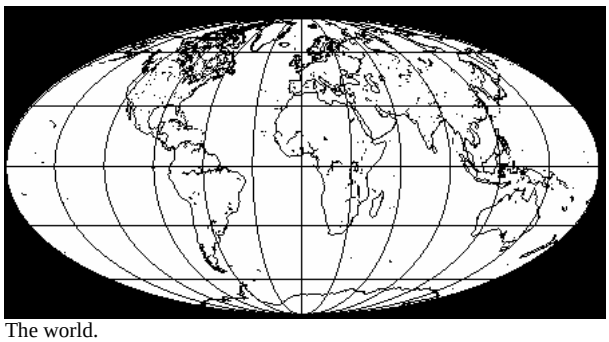
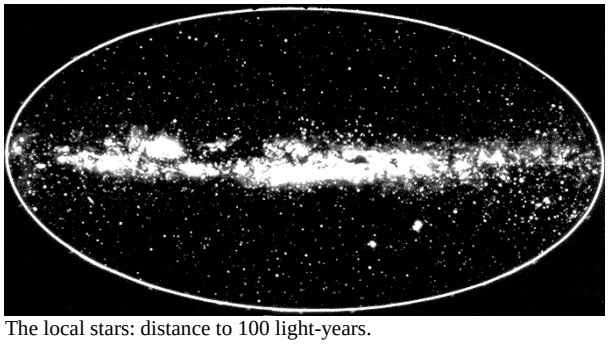
Maps of the Spheres



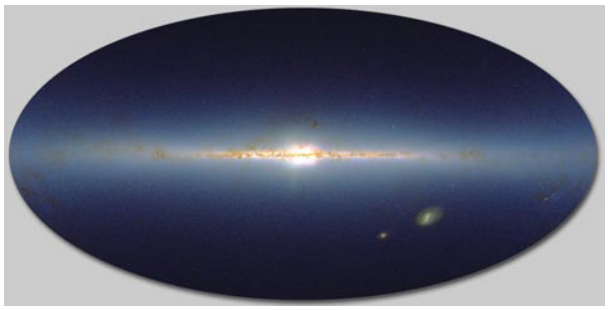
The world.

This is a map of the world. It's difficult to map a spherical earth onto a flat surface. This is one method, called the Mollweide projection. Lines of latitude are straight and parallel, and lines of longitude are ellipses. The equator and the zero latitude line cross at the center. All of the other maps on this page use this same projection.



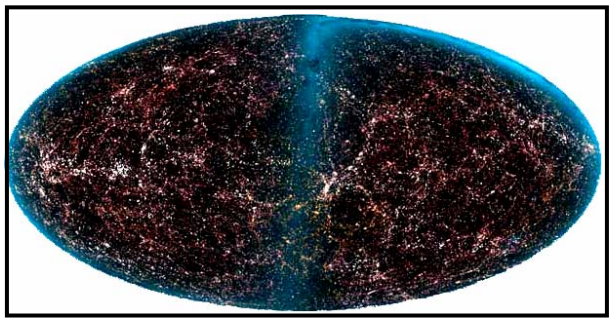
The local stars: distance to 100 light-years.

This is a map of the whole night sky as seen from the earth. We can see a few thousand stars. Most of them are relatively nearby, within about 100 light-years of the earth. A light-year is the distance light travels through space in a year, or about 6 trillion miles. The nearest star is 4.3 light-years away. Of course our sun is also a star; it is only 8 light-minutes away. On a dark night, you can see a faint strip of light across the sky; this is the Milky Way. (The equator of the map has been aligned to the plane of the Milky Way).



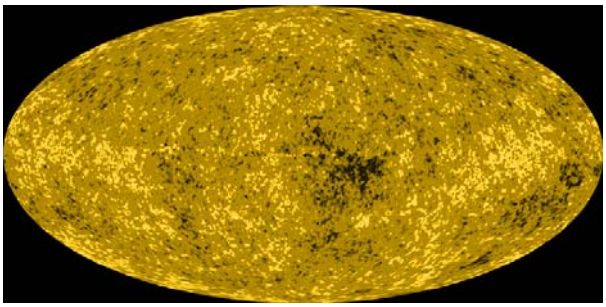
The Milky Way galaxy: distance to center 25,000 light-years.

This is a map of the Milky Way, our home galaxy, which contains about 100 billion stars. The equator in this map is oriented to the plane of the galaxy. You can see that the galaxy is a disk, in which we are located near the outer edge, about 25,000 light-years from the central bulge of stars. Clouds of gas and dust obscure the light from the center in a thin disk across its middle. The two small spots are the large and small Magellanic Clouds, which are nearby smaller galaxies. This image is from the 2-Micron All Sky Survey (2MASS) project released Mar. 25, 2003.



The nearby galaxies: distance to 500 million light-years.

This is a map of all the brighter galaxies within a distance of 500 million light-years. There are about 1.6 million of them. The blue haze is nearby dust in our solar system, and our own galaxy obscures some of them, but you can see that they are not randomly distributed; they occur mostly in filaments or chains, with large empty spaces in between. These empty spaces appear to be expanding uniformly (as discovered by Hubble). This pattern gives us a hint of the large-scale structure of the visible universe, which was shaped by gravity that pulls matter together in this way. (Data collected by the 2MASS project).



The Cosmic Background Radiation: distance 13.4 billion light-years.

This is a map of the cosmic background radiation in the whole visible universe. The radiation is very uniform; variations ("anisotropy") shown here have been exaggerated about 10,000 times so they can be seen. The data from this picture have been used to determine precise values of the age of the universe (13.7 billion years) and details of its early history. It represents the glow of light, originally about 5000 degrees C, that now appears at only 2.725 degrees above absolute zero. The expansion of space stretches the wavelengths of light; this has shifted the radiation from its initial high temperature to its present low value. These measurements were collected in 2002 by the Wilkinson Microwave Anisotropy Probe (WMAP) and released Feb. 11, 2003.