



Famous astronomers

Sir Arthur Stanley Eddington (1882-1944)

was one of the first physicists to realize the importance of Einstein's theory of relativity: the eclipse expedition to the volcanic island of Principe in the Gulf of Guinea proved on 29 May, 1919 that light is deflected from large masses – as postulated by the general theory of relativity.

Edwin Powell Hubble (1889-1953)

proved at the Mount Wilson Observatory in 1923 that the Andromeda nebula M31 lay far beyond our Milky Way. The spatial distribution of other galaxies and the proven redshifts in their light wavelengths led to Hubble's most famous contribution to astronomy: the discovery that the universe was expanding. The expression of this expansion is called the Hubble Constant in his honor.

Observatory instruments

Actual celestial bodies are observed in an observatory using telescopes.

The telescope

The telescope (Greek tele – fern and skopein – to observe) is generally thought to have been invented by eyeglass-maker *Hans Lippershey* (1570-1619), who was born in Wesel in Westphalia, but emigrated to Holland in his early years. However, more recent careful research indicates that *Leonardo da Vinci* was the real inventor of the telescope: he built and used an optical instrument with a low magnification but on a similar principle to those of Lippershey and Galileo.

The development of the actual astronomical telescope is attributed to German astronomer *Johannes Kepler* (1571-1630), which is why an instrument called the Kepler telescope exists to this day. Unlike the

Galilean telescope, the Kepler telescope uses a biconvex lens as the eyepiece, resulting in an inverted image. All current lens telescopes – from amateur instruments to professional observatory equipment – are based on the Kepler telescope principle. Since this type of telescope creates images by refraction, it is also called a "refractor".

The mirror telescope

A mirror telescope is a telescope in which the major part of the optical system consists of reflecting elements – a main mirror and a secondary mirror. The secondary mirror deflects light towards the eyepiece, photographic plate, film or digital receiver, where it is normally passed through color filters for images or spectrographs for spectral analysis before image capture. Large mirrors catch more light: the achievable apparent brightness/marginal size of measurable celestial bodies is higher with

these mirror telescopes, and ensures that the observer can look even deeper into the universe. Because of the diffraction of the light, a mirror telescope's resolution is limited. A point-shaped body (e.g., a star) is not projected as a point, but as an Airy disk.

To reduce aberrations, the mirrors have to be finished with a very high degree of accuracy. They are ground and polished to 1/4–1/20 of the wavelength of light, i.e. with an accuracy of 150–30 nanometers. In addition, these telescopes are built well away from any human habitation in dry regions and on high mountains because the image quality is affected by dust, the glare from cities (light pollution) and the concentration of water vapor in the air.