

Telescopes from the Ground Up

Assessment: Telescope Timeline Answers

Below are 14 important events in the development of telescopes. As you read about the history and development of telescopes, the scientists who built and used them, and the discoveries made with them, take notes that will help you determine the significance and timeline of these events. Describe why each event was important in the history of telescopes and arrange the events in the correct sequence. (Put a 1 next to the event you think happened first, a 2 next to the event you think happened next, and so on, with 14 next to the event you think happened last.)

Rank	Event	Notes	Why is this event important?
4	The first reflecting telescope is built.	Newton built a metal-mirror reflector in the 1680s. (Found in Newton's Era story)	Reflection does not cause dispersion, so images formed by mirrors are free from chromatic aberration. Metal mirrors provided an alternative method of gathering light.
7	Spiral nebulae are discovered.	In 1845, Lord Rosse used his largest telescope to see the spiral structure of M51. (Found in Lord Rosse's Reflector story/Early Reflector Era)	Large telescope mirrors allowed the spiral nature of the M51 nebula to be seen and sketched. Technological advances resulted in scientific discovery.
10	The first permanent solar telescope is built.	By 1904, the Snow Solar Telescope was built and then moved to its permanent home atop Mount Wilson. (Found in Snow Telescope story/Solar Era)	New instruments meant astronomers could study the Sun in more detail, but a new style of telescope was needed – one with a stationary primary mirror and a movable tracking mirror.
9	Scientists learn how to put silver on glass.	1850's: German chemists used a chemical reaction to make a silver-on-glass mirror. (Found in Huge Reflectors Era story and Melbourne story/Early Reflectors Era)	Scientific discovery resulted in new technology: astronomers could build more highly reflective telescope mirrors using (lighter) glass with a metal coating.
12	Computers control and position telescopes.	In 1976, the Russians built the BTA, which was controlled and positioned by computers. The MMT uses a computer-controlled altitude-azimuth mount. (Found in Multimirror Era story and MMT story/Multimirror Era)	Astronomers built smaller, more compact telescopes with even larger primary mirrors. An altitude-azimuth mount is easier to build and puts less stress on the mirrors, so they can be made larger.
8	For the first time, the Moon is photographed through a telescope.	The photo was taken between 1847 and 1850 with the Harvard 15-inch refractor. (Found in Harvard Telescope story/Great Refractors Era)	Photography moved astronomers one step away from the telescope – the film records the information, not the astronomer. Data recording became more accurate.

Rank	Event	Notes	Why is this event important?
1	The spyglass is invented.	Hans Lippershey built the first spyglass. (Found in Galileo's telescope story/Era of First Refractor)	This marks the first use of two lenses to "see" at a distance. The development of the spyglass inspired the birth of telescopes.
14	The Hubble Space Telescope is launched.	HST was launched in 1990. (Found in the Hubble Space Telescope story/Space Era)	Hubble was the first visible-light telescope in space. Technology allowed astronomers to move above the blurring effects of the atmosphere.
2	A telescope is used to discover mountains and valleys on the Moon.	In 1609, Galileo began using his telescope and looked at the Moon. (Found in Galileo's Refractor story/Era of First Refractor)	The Moon is not a perfect sphere, as was thought. This discovery sparked the Copernican revolution, which held that Earth is not at the center of the universe.
11	The first radio telescope is built.	In 1932, Jansky built an antenna array, and in 1937 Reber built a parabolic reflector to collect radio waves. (Found in Reber's Radio Telescope story/Radio Era)	Astronomers began to get a more complete view of the universe. Technological advances in phone communication inadvertently launched radio astronomy.
3	Huygens discovers the bulges around Saturn are separate rings.	In 1686, Huygens built an open-air telescope. He found Saturn's ring with a smaller telescope. (Found in Huygens's Refractors story/Early Refractors Era)	The change to two convex lenses with increased focal length allowed Huygens to clearly see the rings. Technological advances resulted in scientific discovery.
13	The first telescope with multiple primary mirrors begins observing.	The MMT, with its six primary mirrors, started working in 1979. (Found in MMT story/Multimirror Era)	Technology allowed astronomers to combine multiple images to improve light-gathering ability. The telescope was able to see more detail. Its success meant larger multiple-mirror telescopes.
6	A lens doublet without chromatic aberration is made.	In 1729, Hall figured out how to combine lenses of different shapes and materials to fix the chromatic aberration problem. (In Great Refractors Era story)	It became possible to make a refractor that doesn't suffer from chromatic aberration. The image improved, but glass-making techniques had to get better before widespread use.
5	A non-spherical mirror is ground.	In 1721, Hadley built a Gregorian reflector with a parabolic mirror. (Found in Hadley's Reflector story/Early Reflectors Era)	This was the first reflecting telescope that was free of spherical and chromatic aberrations. Image quality improved.

