Name: _____ Galileo and the Telescope

Discovering the Moon (*Afterward*):

Galileo didn't just use his telescope to look at the surface of the moon. He also discovered Saturn's rings and the 4 largest of Jupiter's many moons.

When Galileo looked at Saturn through his telescope, he was confused by the planet's shape. He thought that Saturn had '*ears*' or '*handles*' because it looked to him like the planet's rings were attached to it.

Fifty years later, the Dutch astronomer Christian Huygens built a better telescope and discovered that Saturn's '*ears*' were actually rings circling the planet. Today, we know that the rings are made of billions of icy rocks, each one orbiting Saturn like a tiny moon.

When Galileo looked at Jupiter, he saw three very bright objects near Jupiter. He had no idea what they were. The next night, he came back to it and the objects were still there, but their positions with respect to Jupiter had changed. After a week of observations, he realized that those objects were moons of Jupiter. Like the moon goes around the earth, these moons were going around Jupiter. And there are four of them.

In a little more than a week, Galileo had found the first new heavenly bodies to be discovered since the ancient times—four moons circling Jupiter at tremendous speeds. This discovery clashed with the commonly held belief that the earth was the center of the universe and that *all* the heavenly bodies revolved around it.

Fifty years before Galileo's discovery, the Polish astronomer Nicolaus Copernicus suggested that the Earth and all the other planets move around the Sun. After spending 30 years looking at the sky and taking measurements, Copernicus decided that a *heliocentric* (Sun-centered) model of the universe made more sense than an Earth-centered one. It was much simpler and did a better job of explaining the motion of the planets.

Galileo's observations convinced him that Copernicus was right—the Earth wasn't the center of the universe after all. Instead, the Earth and the other planets all revolved around the Sun. When he wrote a book spreading this idea, Galileo got into trouble and was put under house arrest. (He wasn't

allowed to leave his house.) Under pressure, Galileo publically retracted (took back) what he had written, but privately he went on believing in Copernicus's heliocentric theory.

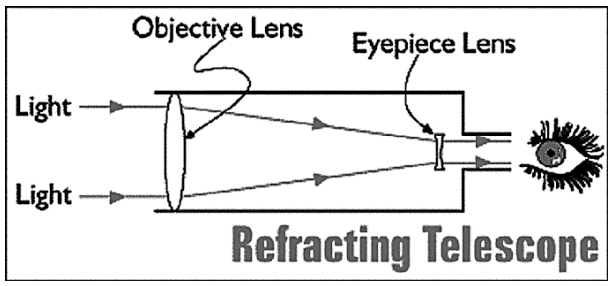
The heliocentric model was eventually accepted because it could predict the motion of the planets and other heavenly bodies better than an Earth-centered model could.

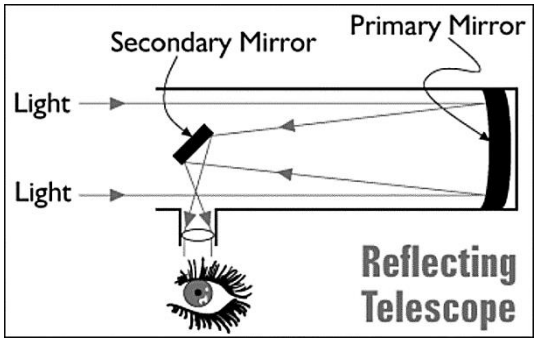
How Does a Telescope Work?

Telescopes basically give you bigger eyes. The reason you see is that light particles (called photons) enter your eyes through your pupils (the black spots in the centers of your eyes). The more light that enters your eyes, the brighter objects will appear.

When it's dark, your pupils grow larger to let in more light, but your pupils can only get so big. Telescopes gather in more light than your pupil can and focus that light into a narrow beam that can fit through your pupil. This makes faraway objects look brighter, larger and clearer.

A *refracting* telescope—like the one Galileo used—uses a lens to gather and focus the light. A *reflecting* telescope—like the one invented by Newton—uses mirrors instead of a lens to do the same thing.





The larger the telescope, the more light it gathers, and the brighter and sharper distant things look. The largest refracting telescope has a 1 meter wide lens to gather light—the lens alone weighs 26 tons. Reflecting telescopes can be larger than this. The largest reflecting telescope has a mirror 10 meters across, and even larger ones (over 3 times as large) are being built. (Mirrors are thinner than lenses, so they weigh less. They also give a clearer image.)