

## *Ask an Astronomer*

Question: "Do the stars really move?"

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Since the dawn of time, people have looked up and watched the stars move across the sky throughout the night.

In ancient times, people believed the Earth stood still, and the stars rotated around it on the inside of a giant sphere.

But then, in the 16th century, a new idea was proposed by the astronomer Nicolai Copernicus.

Copernicus suggested that the apparent motion of the stars was caused by the movement of the Earth. As the Earth turned each night, the stars tracked across the sky. And as the Earth moved around the Sun, the nighttime constellations (those we can see at night in the direction away from the Sun) also changed.

Well, that seemed to be it. It was clear that the movement of stars overhead is an illusion.

But then, in 1718, astronomer Edmund Halley looked at the positions of several stars that had been recorded by the ancient Greek astronomer Hipparchus of Rhodes.

Halley realized that the stars had moved a little bit relative to each other since Hipparchus had measured them nearly 2000 years earlier.

It wasn't until the 20th century that this all started to make sense.

Now we know that we live in a galaxy. Stars in all galaxies actually race around a central core, like racecars speeding around a circular track. Our Sun moves at over 160 miles per second, and takes over 200 million years to go all the way around the galaxy.

Since the Sun's birth the Sun and Solar System have done about 28 such high-speed laps -- always keeping up with the competitors.

We can't see this motion because the stars are so far away.

It's the same as if you look at an airplane. If an airplane is close by, it seems to move very fast, but an airplane flying at 30,000 feet seems to move very slowly, even though they're both moving the same speed.

Stars that are at different distances from the Earth will also reveal their motion over long periods of time. And, like the two airplanes, the stars closest to us will appear to move more quickly.

So, do stars really move? Well, their motion wending their way across the night sky is an illusion caused by the spinning Earth, just as the Sun is seen to move during the daytime.

But all the stars are moving terribly fast (including the Sun and the Earth), speeding around the center of the galaxy in circles like race cars.

For "Ask an Astronomer," I'm Dr. Steve Lord at NASA's Infrared Processing and Analysis Center at the California Institute of Technology.