Student Page 3.1A: GPS Technology

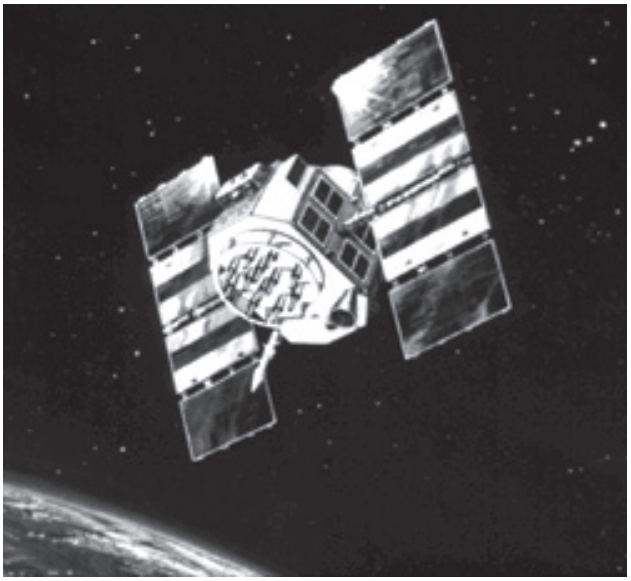
Have you ever used a GPS unit to find your exact location? Or go on a treasure hunt called geocaching? Have you seen a GPS unit mounted in a car to give directions? Different people use GPS in different ways. Mountain climbers often carry a small, hand-held unit. They use it to keep from getting lost. Families, like the people in the news story, sometimes use GPS to find hidden treasure. Some taxi drivers have GPS units to provide them with directions.

GPS units can be small enough to fit in your hand. They can also be larger and fixed to the ground or a building. The GPS unit in this photograph is at a school in Los Angeles.

[Image courtesy of Timothy P. Brown]

What is GPS?

GPS stands for **Global Positioning System**. Twenty-four GPS satellites orbit 20,000 kilometers above Earth's surface. They send special radio signals down to Earth. On the ground, there are GPS receivers. They pick up the radio signals from the satellites.



[Illustration of GPS satellite courtesy NASA]

How do these radio signals work? Think about how lighthouses communicate with boats. A lighthouse sends out signals in the form of flashes of light. A nearby boat captain sees the light signal. The signal tells the captain important information. The captain uses the signal to decide where to sail to avoid shallow water. The GPS system is similar. GPS satellites are like lighthouses. They send out signals with important information. The receivers on the ground are like boat captains. They receive the signal and use a computer to figure out their exact location. Then, different people use the information for different purposes.

How do scientists use GPS?

Scientists have thousands of special GPS receivers. These receivers (called stations) are fixed to the ground at specific locations around the world. Scientists study how the exact locations of these stations change. They use the information to figure out how Earth's surface moves. The GPS system is very accurate. Often, scientists can tell if a station has moved as little as one-half of a centimeter!

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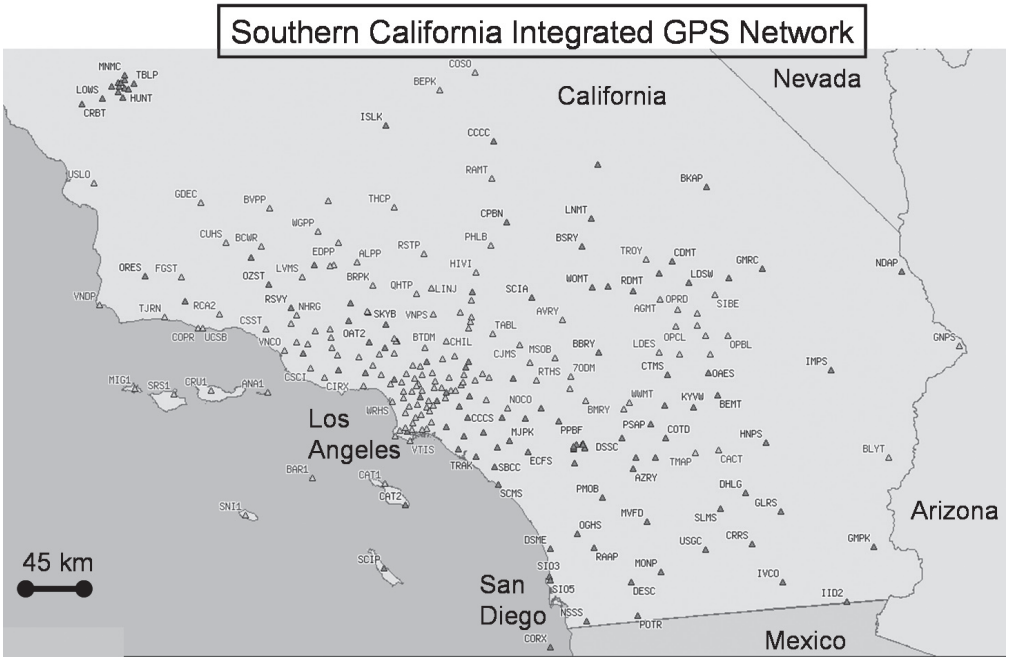
There are 250 GPS stations in southern California. This group of stations is known as SCIGN. SCIGN stands for the Southern California Integrated GPS Network. It is an important tool for scientists who study how the earth moves in your area.

City Hall in Los Angeles was built in 1924. It is now about 3 meters closer to San Francisco than it was in 1924. How can a building on solid ground move?



Map showing locations of GPS stations in the SCIGN. Each small triangle represents a GPS station. [Image courtesy SCIGN.org]