"Seeing" Our Invisible, Intangible Spacetime

The theory of curved spacetime and "frame-dragging" was well developed by Einstein and other scientists. But how could one test the existence of these phenomena?

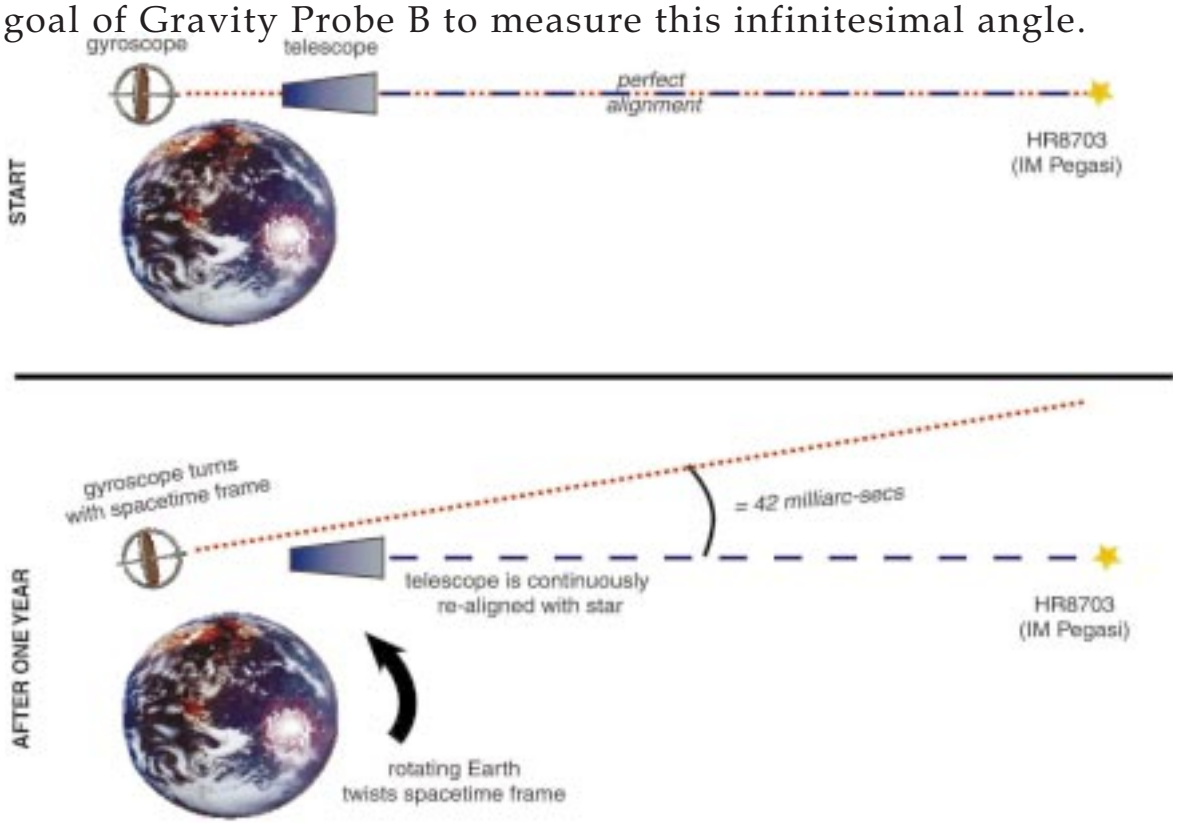
In 1960, Stanford University physicist Leonard Schiff (and, independently, Defense Department physicist George Pugh) suggested that the presence of local spacetime could be "seen" by using gyroscopes. If one could float a gyroscope in Earth orbit, the gyroscope, given its natural inertia, would remain fixed in spacetime. If the spacetime frame moved or was curved, the gyroscope would move with it.

This is in essence howGravity Probe B works:
The apparatus consists of a gyroscope, a telescope and a satellite, the quality of which have never been seen before in space.

1. A gyroscope and telescope will be placed in a satellite and sent into a polar orbit 400 miles (650km) above the Earth.
2. The telescope and the gyroscope axis will be perfectly aligned, and both will point at a distant star (IM Pegasi).
3. Throughout a year of orbit (over the poles every 90 minutes), the telescope will remain fixed on a distant star (IM Pegasus). The gyroscope, which will be floating in a vacuum within the satellite, will be allowed to drift with any changes in the local spacetime frame.

Delicate sensors will monitor these changes and will measure the angle that opens up between where the telescope is pointing and where the gyroscope is pointing at the end of the year.
According to Schiff's calculations, this angle will be 42 milliarc-seconds in one year, or a little more than one hundred-thousandth of a single degree.

It is the goal of Gravity Probe B to measure this infinitesimal angle.



Contact Gravity Probe B at: www@relgyro.stanford.edu http://einstein.stanford.edu
Created by Shannon K'doah Range, March 2001