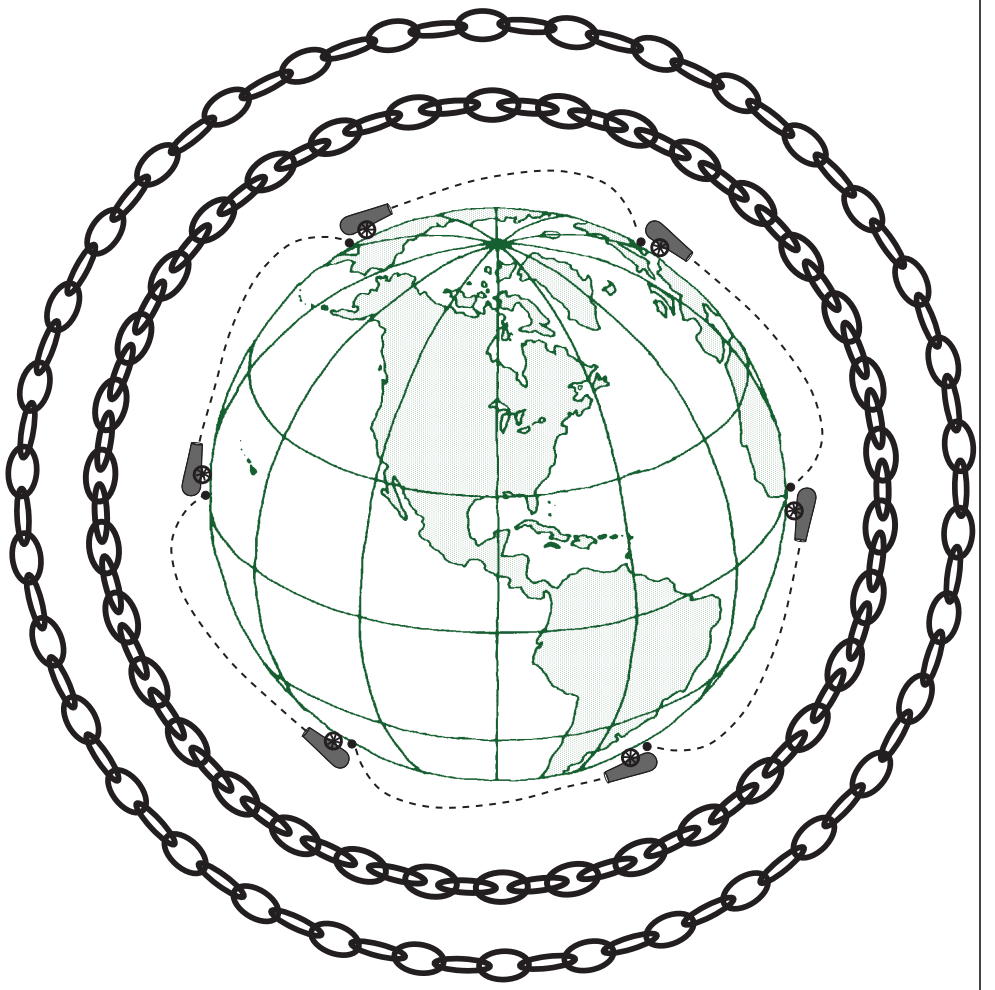
The Orbiting Chain Experiment

by James Carter

To demonstrate an orbit around the Earth, we will first describe an experiment that was available even in Galileo's time. A powerful cannon is fired over the surface of the Earth and the path of the cannonball is recorded. The cannon is then again fired from the point where the first cannonball struck. This process continues until the cannonball has traveled all the way around the Earth.

Orbiting Chains



The inner slack chain is revolving at orbital velocity and the outer tight chain is revolving at greater than orbital velocity.

In each shot, the cannonball traveled in a straight line until it was struck by the upwardly moving Earth. However, a series of photos of the cannonball's path would show that it appears to follow a parabolic curve. In this digital orbit of the Earth, the cannonball always travels in a straight inertial line but at the same time its path always seems to curve downward. This apparent non-inertial curvature of the Earth's internal space results from the expanding and curving dimensions of mass, space, and time.

The orbiting chain thought experiment is another possible model for visualizing an orbit around the expanding Earth. The chain is wrapped around the Earth and then spun at a high velocity. As the chain goes faster and faster it tightens up and goes into an Earth orbit defined by its length. The faster the chain is spun beyond its orbital velocity, the tighter it becomes due to its increasing centripetal force.

To better understand how orbits work around gravitationally expanding bodies of matter, we can cause the chain to slow until its centripetal acceleration becomes less than the acceleration of gravity. The individual links will slacken and lose their tension with one another. However, the slack chain as a whole still maintains its overall orbit while each loosely connected link maintains its own individual orbit without needing to physically touch the other links. The dynamics of this orbiting chain satellite are the same whether we use the mechanics of gravitational expansion or the attraction and field theories of Newton and Einstein.

The Fourth Vector

While the visualization of orbital revolution may seem difficult with gravitational expansion, it is all but impossible with general relativity. Einstein described orbiting bodies as moving in straight inertial lines. These lines seem to be curved when passing through the four-dimensional curvature of his assumed spacetime continuum. While both ideas of gravity defy visualization at some level, the mechanism of gravitational expansion can at least be plainly understood and visualized. However, the way that general relativity really works remains a perceptual mystery. Einstein imagined that gravity was caused by a curving fourth dimension of space and time but when we measure gravity we find that it is really caused by a fourth vector of the motion for mass and time.

We usually visualize the motion of bodies along three one-dimensional vectors. However, gravitational motion is along a fourth curving three-dimensional vector away from Earth's center. It is very difficult for the mind's eye to combine the familiar one-dimensional vectors of motion with the three-dimensional vector of gravity. The mind has difficulty imagining that the slack links of the chain are all moving in straight inertial lines while they circle Earth.