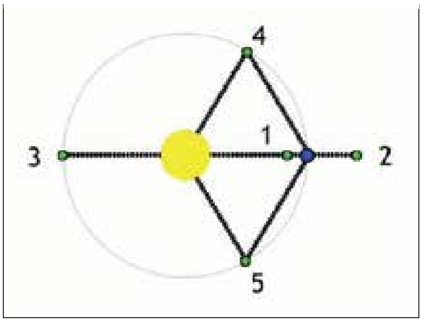
they are called the five Lagrange Points, after their discoverer. At Lagrange points, the gravitational pull of two large masses precisely equals the centripetal force required for a small object to move with them. The L1, L2, and L3 points are all in line with each other—and L4 and L5 are at the points of equilateral triangles.

FIGURE 2



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The five Lagrange Points, relative to the Sun-Earth gravitational system.

Johannes Kepler (1571-1630), whose 450th birthday we celebrated on Dec. 27, developed what are called his three planetary laws of motion, which are:

1. Every planet's orbit is an ellipse with the Sun at a focus;

2. An imaginary line joining the Sun and a planet sweeps out equal areas in space in equal times;

3. The square of a planet's orbital period (the time it takes to orbit the Sun) is proportional to the cube of the semi-major axis of its orbit.

Referring to **Figure 2**, you'll note that both L1 and L2 are along a line between the Sun and the Earth. You'd expect that L1 would rotate on its orbit slightly faster than Earth does on its orbit, and L2 slightly slower. But, remarkably, due to a combination of forces (gravitational, centripetal and the apparent centrifugal), these points move in their orbit with the same periodicity as Earth.

This means that the JWST will maintain its alignment with the Earth all the way around the Sun, while also orbiting L2 at right angles to the plane of Earth's orbit, so its motion would appear as a type of epicycle (like a Ferris wheel moving along a track). This allows for a minimum expenditure of fuel to keep it in its orbit; the JWST was designed with a nominal five-year mission, but is expected to endure for at least 10 years, and probably longer. An animation of the orbit is available here.

These Lagrange Points are already being used for some solar observations—L1 is host to ACE (Advanced Composition Explorer), DSCOVR (Deep Space Climate Observatory), SOHO (Solar and Heliospheric Observer), and the 1994 Wind spacecraft; L2 has the satellites Herschel, Planck and WMAP.

The properties of Points L4 and L5 are equally impressive: Both L4 and L5 are strategic and durable gravity wells in which larger missions, such as a large space station or way-station, could be maintained for long periods of time. Since these points are equidistant from Earth, they could be used for long-term spacecraft construction projects, where materials were ferried between Earth (or Moon), and these points of stability (although not for a planet with a lot of asteroids or space debris).

Joel Dejean: 'Kepler and the James Webb Space Telescope'

Joel Dejean, running as a LaRouche Independent candidate for U.S. Congress from Texas' new 38th C.D., released the following statement on the launch and mission of the James Webb Space Telescope.

Dec. 27—Johannes Kepler was born on December 27, 1571, 450 years ago. Using the naked-eye observations of Tycho Brahe, he was able to formulate the laws of planetary motion that are being used to guide the James Webb Space Telescope, launched on Christmas day, to its observation station 1.5 million kilometers from Earth.

While working on his *Harmony of the World*, Kepler and the rest of Europe were at the beginning of what came to be known as the 30 Years' War, which killed a third of Europe's population. Today, we are in danger of sleep-walking into a thermonuclear war, which would wipe out *all* human civilization. Let us use the example of the James Webb Telescope, where scientists and engineers from 14 nations, working over 25 years, and spending 200 times less than that spent over the last 20 years by the U.S. and NATO to destroy Afghanistan, as an example of what Mankind is capable of, when it puts its mind to a truly human goal.

Think of what Kepler was able to discover about the solar system, using only naked-eye observations. What will a future Kepler be able to discover about the universe, using fantastic instruments like the James Webb?