

# Joseph-Louis Lagrange

Discoverer of the Lagrangian Points in orbits,  
as a solution to the three-body problem.

Appointed by King Louis XVI of France to  
reform the system of weights and measures,  
which resulted in the

*Système International d'unités (S.I.)*  
set of metric units we use today.

excerpted from

“Understanding the Universe, from antiquity to the  
present day, with an Australian perspective”

Version: 2024.03.31

ISBN 978-0-9924388-4-5

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Uploaded on 4 April 2024

**Giuseppe Lodovico (Luigi) Lagrangia** (1736-1813, *right*), born at Turin in Piedmont, Italy, was a mathematician and astronomer.

Leonhard Euler, head of the Prussian Academy of Sciences, had wanted him to come to Berlin, but Lagrangia did not wish to work under Euler's shadow and stayed in Turin. After Euler moved on to St Petersburg, Lagrangia took over directorship of the Berlin Academy in 1766.

He studied the three-body problem for the Earth, Sun, and Moon (1764) and the motions of Jupiter's satellites (1766), and in 1772 published the special-case solutions to these problems, where a small object affected only by gravity can occupy a stable position in orbit relative to the two larger bodies. Such positions are now known as **Lagrangian Points**.

Asteroids (SSSBs) that share the orbits of Mars, Jupiter or Neptune, but are located at Lagrangian Points  $L_4$  and  $L_5$  ( $60^\circ$  ahead or behind the planet respectively) are called **Trojans**. The Earth has one Trojan, **2010 TK7**, found in 2010 and sharing our orbit at Lagrangian Point  $L_4$ .

Some artificial satellites today are stationed permanently at Lagrangian points in the Earth's orbit: the SOHO (Solar and Heliospheric Observatory) and DSCOVR (Deep Space Climate Observatory) are at Earth-Sun point  $L_1$ , and the WMAP (Wilkinson Microwave Anisotropy Probe), Gaia, Herschel and Planck Space Observatories are (or were) at the Earth-Sun Lagrangian point  $L_2$ , where the *James Webb Space Telescope (JWST)* was positioned on 24 January 2022 (*below*).

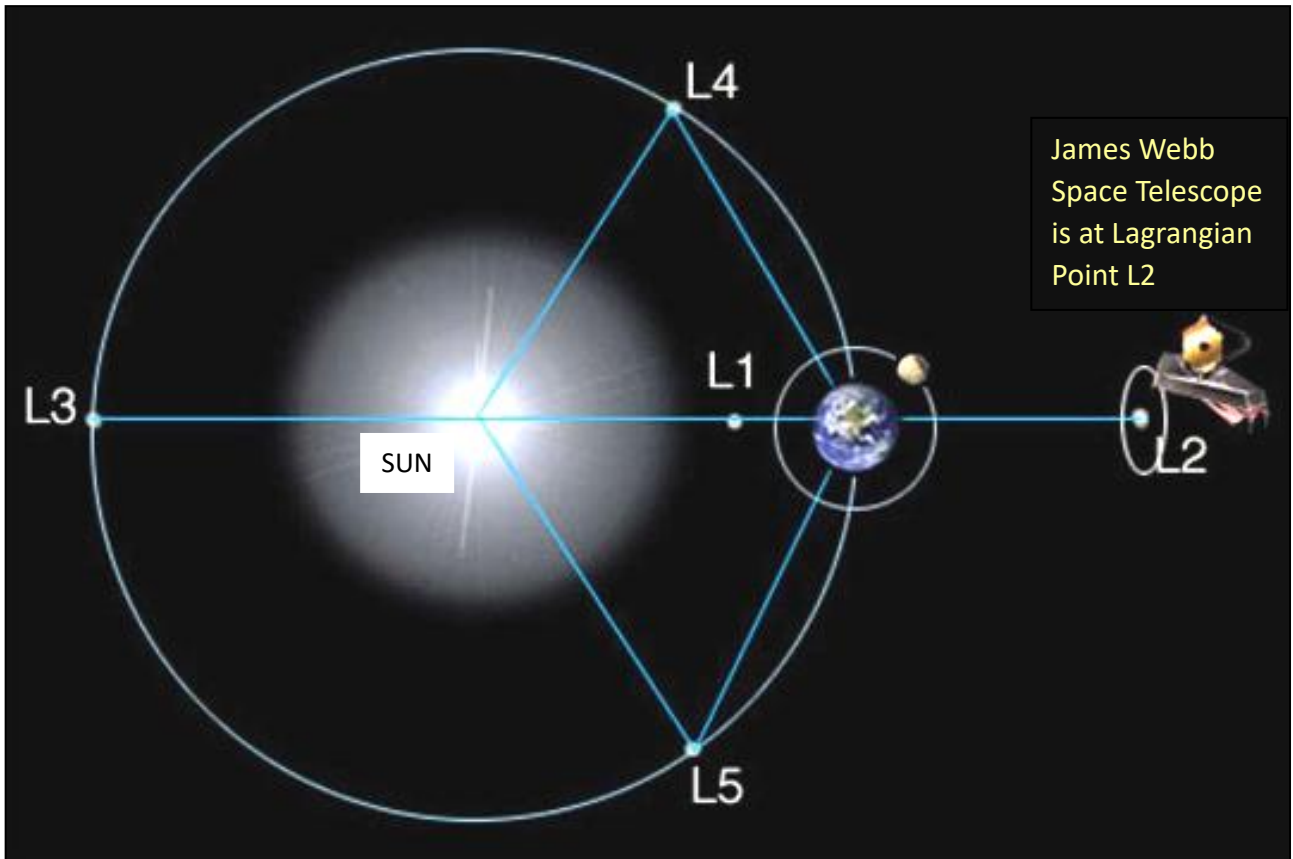
After twenty years in Berlin, in 1786 King Louis XVI induced Lagrangia to move to Paris, offering him many honours and even apartments in the Louvre palace. There he remained for the rest of his life, changing his name to **Joseph-Louis Lagrange**.

Lagrange improved on the work of Newton, Euler and Tobias Mayer to develop a series of equations in celestial mechanics, which he published in his book ***Mécanique Analytique*** of 1788.

The French Revolution began in 1789, and King Louis XVI was arrested. He went to the guillotine on 21 January 1793. A decree in October of that year ordered all foreigners to leave France, but Lagrange was specifically exempted by name. Even so, he was preparing to depart when he was offered and accepted the presidency of a new commission for the reform of weights and measures. There were four other Commissioners (Pierre-Simon de Laplace, Gaspard Monge, Nicolas de Condorcet and Jean-Charles de Borda), but Lagrange was the President.

The choice of the units finally approved was largely due to him, and the ***Système International d'unités (S.I.)*** set of metric units we use today, based on the decimal system (metres, kilometres, grams, kilograms, litres, etc), was adopted by the commission on 30 March 1791. He survived the Revolution and was made a Count of the Empire by Napoleon, who was a keen patron of the sciences.





James Webb  
Space Telescope  
is at Lagrangian  
Point L2

*End.*