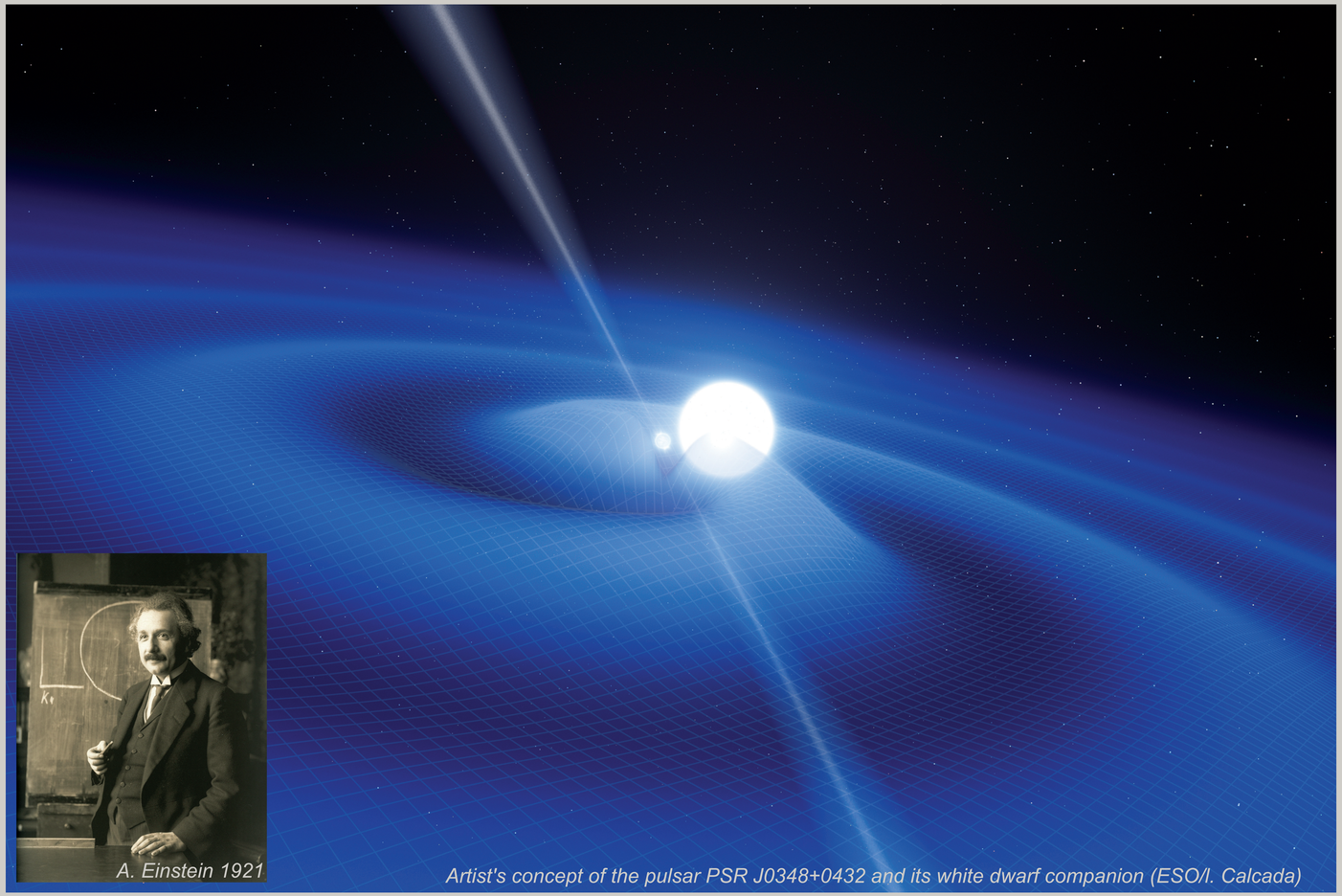
A fundamental physics laboratory

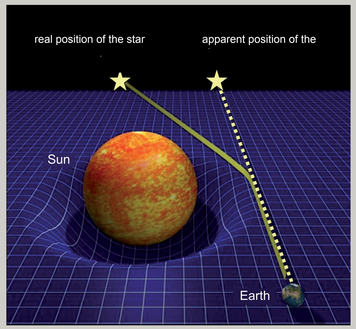
Gaia observations can be used for high-precision tests of general relativity. Scientists will compare its predictions against the Gaia observations in order to determine how accurate these predictions are.



A. Einstein 1921

Artist's concept of the pulsar PSR J0348+0432 and its white dwarf companion (ESO/l. Calcada)

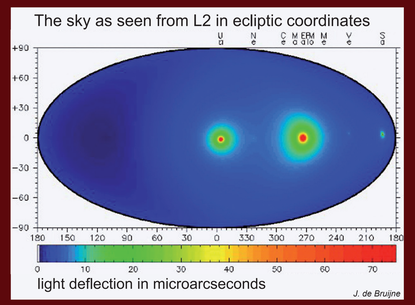
Gaia observations: a challenge to model



The gravitational attraction of the Sun and the planets causes light not to follow a straight line but to describe a curved trajectory.
This is of course a small effect but it must be taken into account due to the high precision of Gaia observations.
It has been necessary to develop a model based on the theory of general relativity to predict this effect with microarcsecond accuracies.

Verifying the theory of relativity

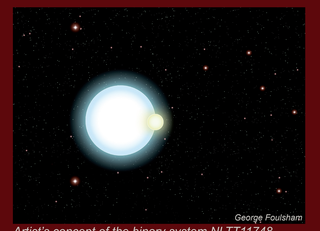
Gaia's relativistic model is characterized by a parameter called γ. If Einstein was right, its value is 1. Gaia can determine the value of γ with an accuracy of one part in a million.



Verifying the temporal constancy of G

$$F = \frac{Gm_1m_2}{r^2}$$

Is the gravitational constant in Newton's law of universal gravitation really constant in time?
This is usually taken for granted.
With its observations of asteroids and white dwarfs Gaia can find out whether the value of the gravitational constant has varied throughout the history of the universe.



Artist's concept of the binary system NLTT11748 composed of two white dwarfs.

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