Development of views on the nature of light. The speed of light.

At the end of the 17th century, almost simultaneously, had two seemingly contradictory theory of light

They relied on two possible ways to transfer actions from the source to the receiver.

I. Newton invited corpuscular theory of light, the light is a stream of particles coming from the source to all parties (transfer of a substance).

H. Huygens developed the wave theory of light was seen as waves propagating in a special environment-air, filling all the space and only inside all bodies (changing the State of the environment).

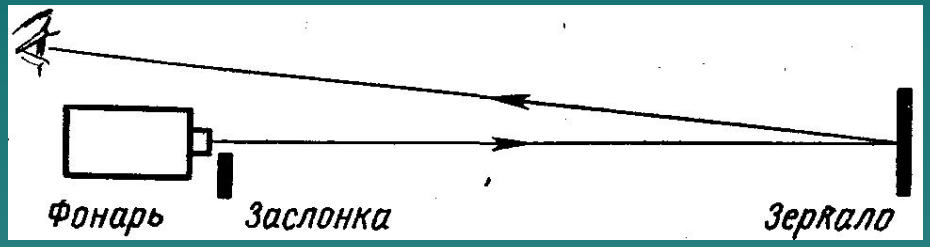
Newton	Huygens
1. **It's hard to explain why the beams intersect in space do not act on each other (particles must collide and diverge).**	1. Wave freely pass through each other without mutual influence.
2. Straight-line propagation of light is a consequence of the law of inertia.	2. Does not explain.
3. Does not explain.	3. Easy to explain diffraction and interference.
4. When the emission and absorption of light behaves like a particle flow.	4. Light is a special case of electromagnetic waves

What is light?

According to the ideas of modern physics, light has the properties both of continuous electromagnetic waves and the properties of discrete particles, called photons or quanta of light.

The duality properties of light is corpuscular-wave dualism.

By using any of the methods, measured the speed of light?

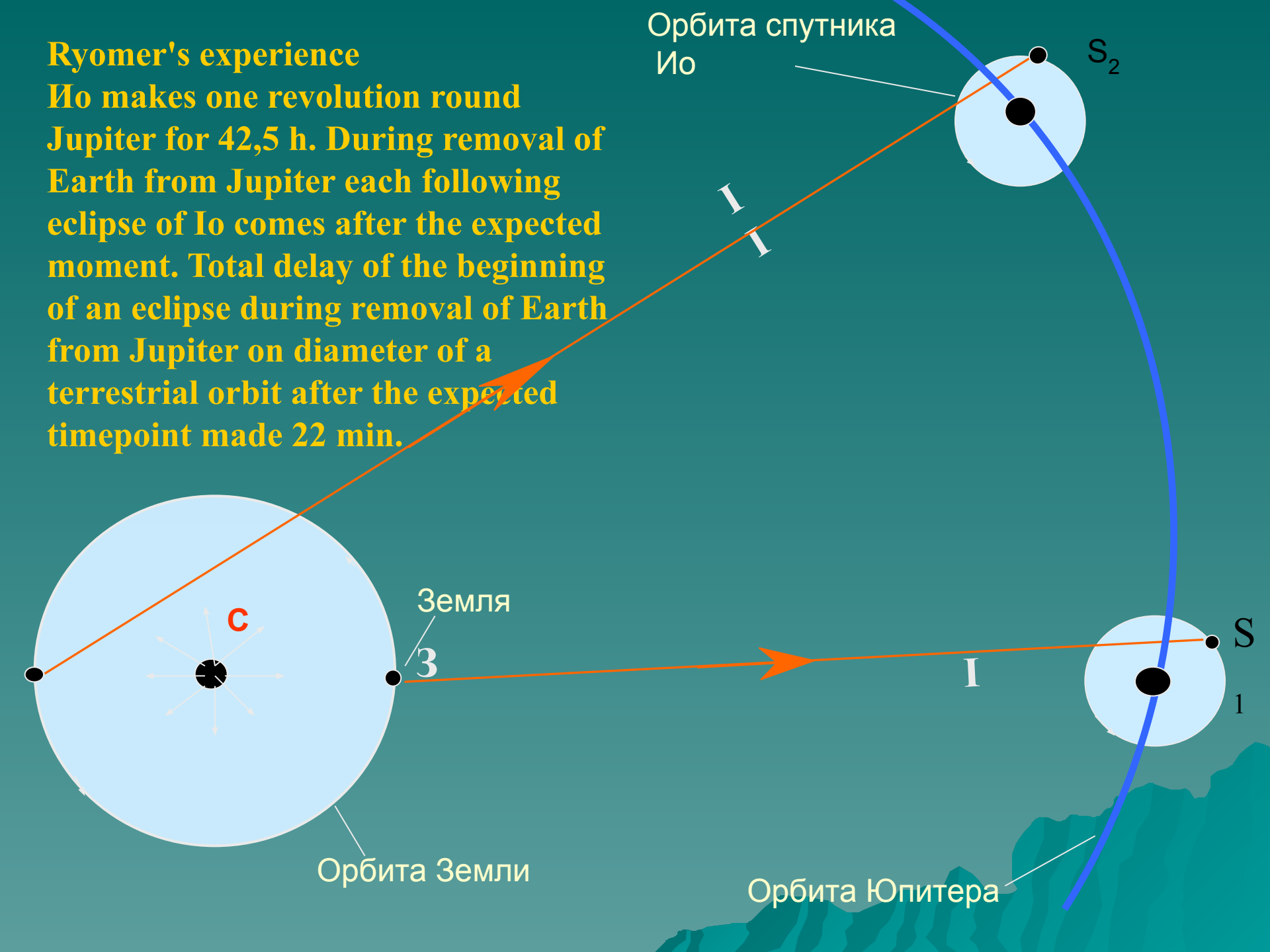


The figure shows a diagram of the experience through which Galileo proposed to measure the speed of light. Opening the valve lantern, you need to determine how to return the light reflects from the mirror.

It was the first known attempt of experimental determination of velocity of light undertaken by Galileo Galilei. However it wasn't succeeded to find delay of a signal because of a high speed of light.

The first experimental determination of velocity of light was executed by the Danish astronomer Olaf Ryomer in 1675.

Ryomer's experience
Ио makes one revolution round Jupiter for 42,5 h. During removal of Earth from Jupiter each following eclipse of Io comes after the expected moment. Total delay of the beginning of an eclipse during removal of Earth from Jupiter on diameter of a terrestrial orbit after the expected timepoint made 22 min.



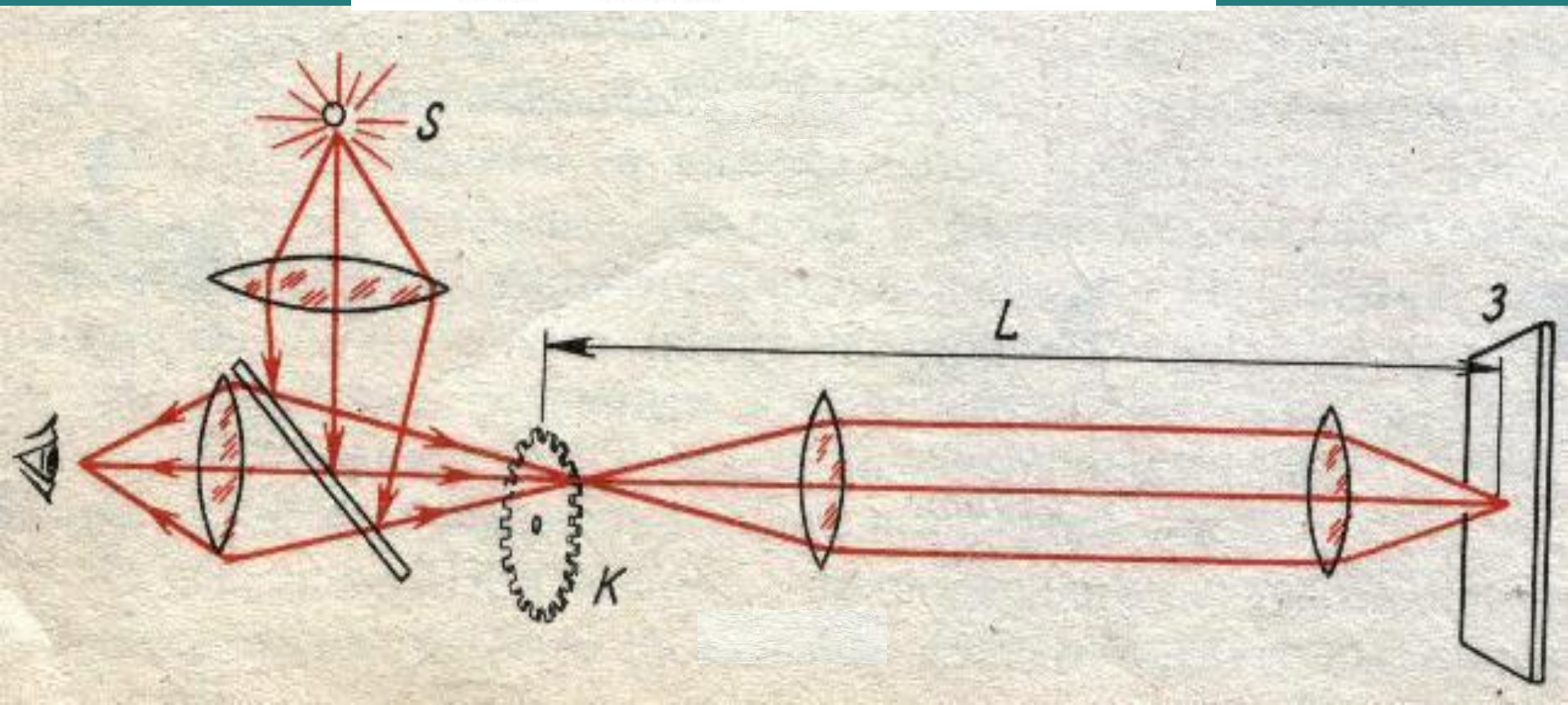
The first laboratory measurement of velocity of light was executed in 1849 by the French physicist Armand Fizo.

In its experience light from a source of S passed through the breaker K (teeths of the rotating wheel) and, having reflected from a mirror Z, came back again to a cogwheel.

Fizo Method:

$$t = \frac{2 \cdot L}{c} \qquad t = t'$$

$$t' = \frac{T}{2 \cdot N} = \frac{1}{2 \cdot N \cdot \nu} \qquad c = 4 \cdot L \cdot N \cdot \nu$$



Parameters of the unit of Fizo are that. The light source and a mirror settled down in the house of the father Fizo near Paris, and a mirror — on Montmartre. The distance between mirrors made ℓ ~ 8,66 km, the wheel had 720 teeth. It rotated under the influence of the clockwork set in motion by the falling freight. Using a tachometer and a chronometer, Fizo found out that the first blackout is observed at a speed of rotation of a wheel of v = 12,6 об/с . Time of the movement of light of $t=2\,l\,/\,c$ therefore gives

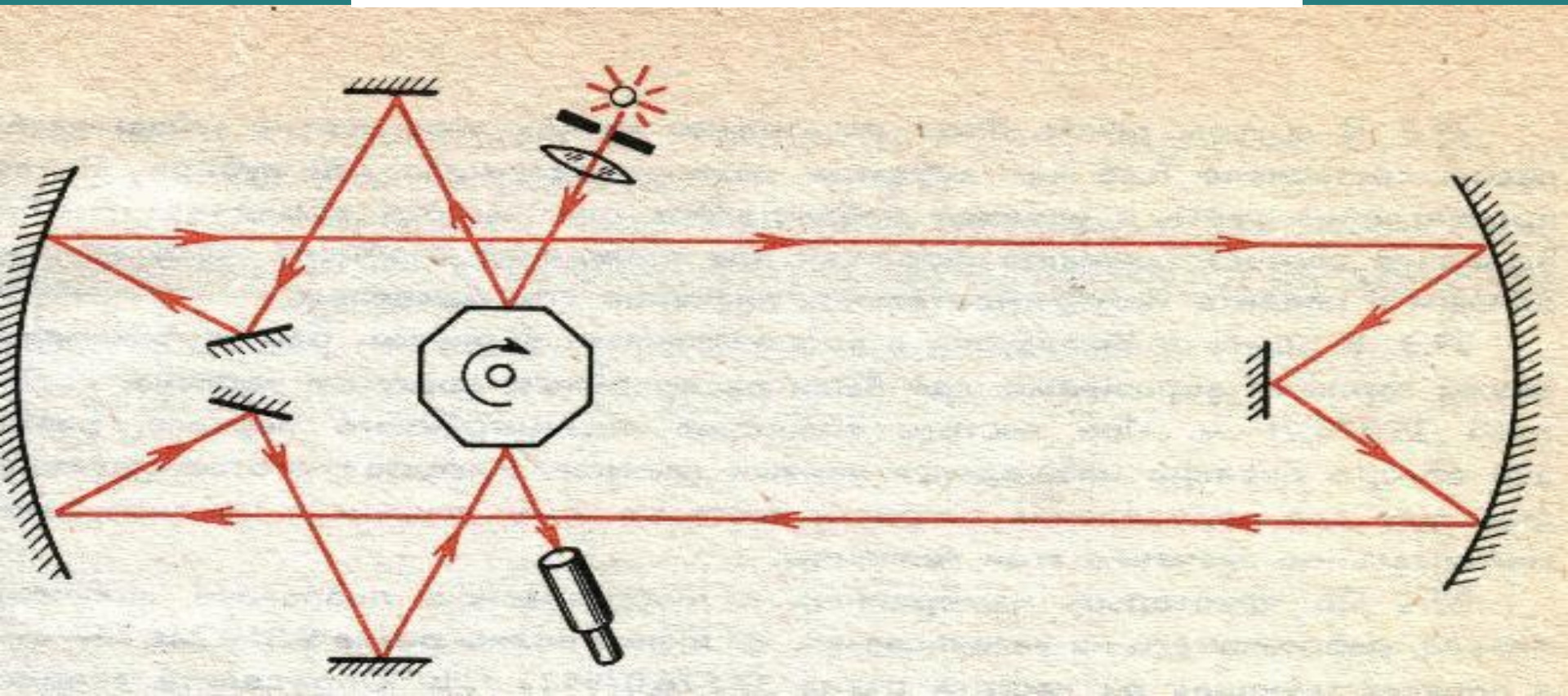
$$c = 3{,}14 \cdot 10^{8}\ \text{м/с}$$

The American physicist A. Michelson developed a perfect method of measurement of velocity of light with application of the rotating mirrors.

Michelson's method:

$$t = \frac{2 \cdot L}{c} \qquad t = t'$$

$$t' = \frac{T}{N} = \frac{1}{N \cdot \nu} \qquad c = 2 \cdot L \cdot N \cdot \nu$$



Conclusions:

1. The nature of light possesses corpuscular and wave dualism (duality).
2. It is necessary to recognize as the scientific fact established experimentally – an extremity and absoluteness (invariant) of velocity of light in vacuum.
3. Confirmation of any physical theory are the experimental facts.

Thank you for your attention