

To be discussed

## Long Whole Stick's Paradox – Motion with Endless Big Speed

*Evgeni Bantutov*

*Institute of Information Technologies, 1113 Sofia  
 E-mail: ebantutov@mail.bg*

The essence of long stick's paradox is exhibited by realizing the following intellectual experiment: A frame of reference  $xyz$ , with a beginning point  $O$  and a stick with a cylindrical form, mass  $m$ , ends – point  $A$  and point  $B$ . The distance between point  $A$  and point  $B$  is equal to  $S$  ( $AB=S$ ) are given.

In order to make easier the analysis, which we are going to accomplish, we assume, that the mass  $m$  (of the whole stick), is concentrated in the straight line, which connects point  $A$  and point  $B$  (as it is shown on Fig. 1 – straight line, which connects point  $A$  and point  $B$  is shown with breaking line).

The action of force  $\vec{F}$  is applied at point  $B$  with the direction shown on Fig. 1.

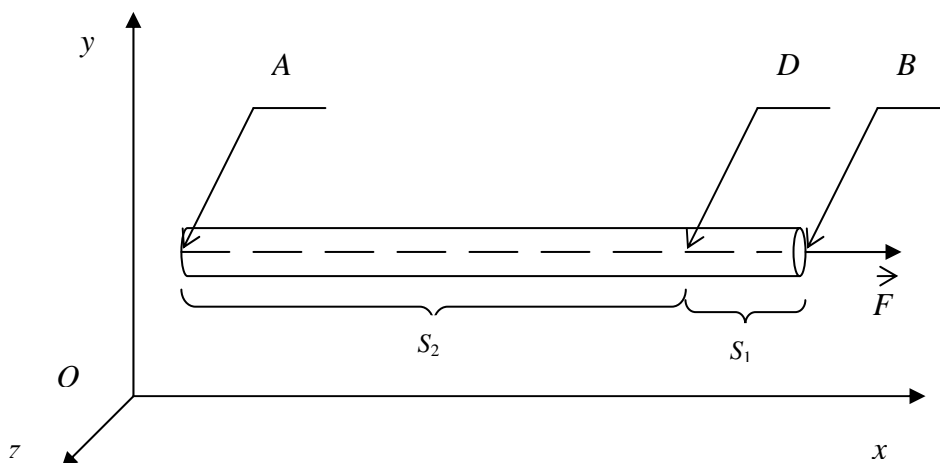


Fig. 1

The vector of force  $\vec{F}$  is parallel to the coordinate axis  $x$ . As a result of the applied (pulling) force  $\vec{F}$ , the stick with mass  $m$  moves with acceleration  $\vec{a}$ . We assume that the friction force is equal to 0. The direction of the acceleration vector  $\vec{a}$  coincides with the direction of the vector of applied force  $\vec{F}$ . The dependence between the size of force  $\vec{F}$  and acceleration  $\vec{a}$  is defined by Newton's second law, where  $\vec{F}$  is the force, applied at point,  $m$  is stick's mass,  $\vec{a}$  is stick's acceleration.

At the time moment  $t_1$  we stop the acting of force  $\vec{F}$ .

According to Newton's first law, the stick with mass  $m$  will change its state of motion with acceleration  $a$ , in a state of uniform rectilinear motion.

A question appears: How was the change in the stick state of motion performed? The intuitional quick answer, which agrees with Newton's laws, is that this change was performed in the whole stick at one and the same time. If the offered answer is correct, this means that the stick's end, where point  $A$  (Fig. 1) is, at the same moment of time  $t_1$  "understood" that the acting of force  $\vec{F}$ , applied at point  $B$ , was aborted at the time moment  $t_1$ .

If this is true, then we can make the conclusion, that at the time moment  $t_1$  from point  $B$  to point  $A$  a signal, which carries information for the aborting force  $\vec{F}$  acting moved, and the signal shown was moving from point  $A$  to point  $B$  with endless big speed. This conclusion contradicts to contemporary physics and at this stage of our analysis we accept that the conclusion made is not true, which requires to continue the examination of the appeared contradiction.

After stopping the force action  $\vec{F}$ , at the time moment  $t_1$ , a signal begins to disseminate from point  $B$  to point  $A$ , a signal, which carries a message that the action of pulling force  $\vec{F}$ , applied at point  $B$  has been stopped. At time  $t_2$ , a signal, which carries a message for eliminating the action of force  $\vec{F}$  and moves from point  $B$  to point  $A$  will be in some arbitrary chosen point  $D$ , which belongs to the endless great number of points, lying on the straight line  $AB$ .

The distance between point  $D$  and point  $B$  is equal to the way  $S_1$  ( $DB=S_1$ ), traveled by the signal, which moves with some speed  $\vec{V}$  ( $S_1=\Delta t \cdot \vec{V}$ ) during some interval of time  $\Delta t$  ( $\Delta t=t_2-t_1$ ), where:

$\Delta t$  is the time, for which the signal, which carries a message for aborting the action of force  $\vec{F}$ , moves from point  $B$  to point  $D$ ;

$\vec{V}$  is the speed of the signal, which carries a message for aborting the action of force  $\vec{F}$ ;

$S_1$  is the way, passed by the signal and equals the distance between point  $B$  and point  $D$ .

At this stage of our intellectual experiment, we assume that the speed of the signal, which carries a message for the aborted action of force  $\vec{F}$ ,  $\vec{V}$  is equal to the light speed  $c$  ( $\vec{V}=c$ ), where:  $\vec{V}$  is the signal's speed,  $c$  – light speed.

The part of the stick, which is determined from point  $B$  and point  $D$ , which is of length  $S_1$  (line  $DB$ ) received the message for aborting the action of force  $\vec{F}$ , and in accordance to Newton's first law, will be in a state of rest or in uniform rectilinear motion. In our case, the part of the stick, named  $BD$  is unbreakably connected with the whole stick  $AB$ .

The remaining part of the stick, named  $AD$ , at the time moment  $t_2$  still hasn't received a signal that the action of force  $\vec{F}$  was aborted. Therefore, the force  $\vec{F}$  continues to act over the part  $AD$  and according to Newton's second law, this part will continue to move with acceleration  $\vec{a}$ . The direction of the vector of acceleration  $\vec{a}$  coincides with the direction of the vector of the acting force  $\vec{F}$ . This direction coincides with the position of part  $BD$  on the stick. Therefore part  $AD$  will act over the part  $BD$  with a force  $\vec{F}$ . The part  $BD$ , for which we made a conclusion that is in a state of rest or uniform rectilinear motion, will continue to move with acceleration  $\vec{a}$  as a result of the acting force  $\vec{F}$ .

The conclusion we make is strange, and becomes a paradox, when we carry out our intellectual experiment to the end.

This means the following: A signal, which carries a message, that the acting of force  $\vec{F}$  is aborted, will pass the distance from point  $D$  to point  $A$ , which is equal to  $S_2$  ( $DA=S_2$ ),  $BD=S_1$ ,  $S_2=S-S_1$ , where  $S$  is the length of the stick by condition.

At time moment  $t_3$  the signal will arrive at point  $A$ , where the stick's end is

found:  $t_3 = \frac{AB}{\vec{V}} = \frac{S}{\vec{V}} = \frac{S}{c}$  where:  $BA=S$  is the length of the whole stick,  $\vec{V}=c$  is the

light speed.

At time moment  $t_3$  point  $A$  will receive a message that the action of force  $\vec{F}$  is aborted, and according to Newton's first law, point  $A$  will be in state of rest or in uniform rectilinear motion.

In the condition, point  $A$  is a point of the whole stick and as a part of it, it can't be separated from it, and it will participate in the common motion or rest of the whole stick. As a result of our analysis, we reach the conclusion that all the points, which belong to the straight line  $AB$ , through which the signal has already passed, are in a state of accelerative motion. Therefore, point  $A$ , which is an unbreakable part of the stick, will also return to this condition. In this way we reach the conclusion that after the signal (for aborting the action of force  $\vec{F}$ ) passing, from the stick's beginning (which is point  $B$ ) to the stick's end (which is point  $A$ ); it (the stick) continues to move with acceleration  $\vec{a}$ .

The first possible conclusion we can make is that in accordance with Newton's second law, force  $\vec{F}$  continues to act on the stick.

We, the subjects, who make this intellectual experiment, know that the action of force  $\vec{F}$  is aborted. It proves that in a strange way, the force  $\vec{F}$  acts on the stick again.

The second possible conclusion we can make is that the stick moves accelerative, but force  $\vec{F}$  doesn't act on it, which contradicts to Newton's second law.

We cannot agree with these two paradox conclusions, which contradict to the phenomenon, observed in reality, and to the basic, fundamental principle laws in the classical physics.

The paradox shown will disappear, if we assume that the signal, which carries information for the aborted action of force  $\vec{F}$ , is moving with endless big speed.

We have to mark that any other speed, no matter how big it is, but different from endlessly big, can not explain the paradox discussed.

So, we can make following conclusions:

**Principle 1.** A phenomenon exists, the essence of which is the parallel change of the whole and of the endless multitude of the different parts, which belong to the whole.

If we say it in other words, a phenomenon, which moves, disseminates with endless big speed, does exist.

The change in the acting of a force is such a phenomenon.

Two new physic quantities are defined in this connection:

Accelerance:

$$(1) \quad @ = \frac{S}{t^3}.$$

**Definition 1.** Accelerance @ is the third derivative of the way of time.

Effort:

$$(2) \quad \Phi = m @.$$

**Definition 2.** Effort  $\Phi$  is equal to the product from the mass of a body –  $m$  and the accelerance @, and it is a concept for marking the quantity of the absolute interaction.

## Conclusion

The defining of the effort and the accelerance and writing the dependence between them appears as a fundamental law in the bases of classical physics.

Effort  $\Phi$ , accelerance @ and the connection between them allow some basic concepts in physics to be defined:

1. The force  $\vec{F}$ , defined in Newton's second law is a concept for marking the quantity of the relative interaction.

2. The effort  $\Phi$  is a concept for marking the quantity of the absolute interaction.

3. Heavy mass  $M_0$  is a concept for marking the quantity of interrupting in the uninterruptings.

4. Inert mass  $m_0$  is a concept for marking the uninterruption of the connection between the interruptings.

The defining of inert mass  $m_0$  is in accordance to Mach's principle and the idea, that the reason for the phenomenon inertness of a concrete body with a heavy mass  $M_0$  is the connection (interaction) between the body's mass and the distant masses of the Universe (reality).

In connection with the analysis considered we have to mark that it is interesting to examine the supreme derivatives of way in time. Considerations are possible, which show that some of them own extremely interesting characteristics, which appear secretly in mathematics presentation of basic physical hypotheses and theories.

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## Парадокс длинной целой палки – движение с безгранично большой скоростью

*Евгени Бантутов*

*Институт информационных технологий, 1113 София*

### (Резюме)

В современной физике принято как аксиома, что скорость света самая большая возможная скорость, при помощи которой можно перенести энергию и информацию в реальности. В работе предлагается осуществление мысленного эксперимента, представляющего метод экспериментальной проверки возможного существования или несуществования явления „движение с безгранично большой скоростью”.

Сделано предложение для изобретения, которое связано с методом появления, излучения, распространения и принятия сигнала, движущегося с безгранично большой скоростью, которого можно применять в коммуникационных и информационных технологий при передачи, распространении и принятии сигналов, сообщений и информации с безгранично большой скоростью.

Входящая экспертиза заявки для изобретения, представлена в Патентном ведомстве Болгарии является положительной.