The affinity of the trajectory - elliptical and segmental

(Translated from Polish into English by Maksymilian Miklasz)

Abstract: In the article is presented in detail the question of mutual permeation of particles of matter. This phenomenon is not dependent on the position of particles in space, or the size of the structural arrangements which form one with another. The article discusses several types of trajectories along which can move two fundamental particles or two cosmic bodies when they form the binary system. There are presented conditions in which there is a change in the nature of trajectory of bodies relative to each other.

At the beginning it is necessary to explain what is segmental trajectory. The name of this type trajectory has not been used in the natural sciences. But here it will be necessarily needed. To understand the essence of segmental trajectories, you could help in this case - you can throw a stone vertically up or drop from a height. And this stone will travel along segmental trajectory. Although it will be only a small part of the whole trajectory, but having this piece is not difficult to imagine the rest of the segmental trajectory. Just imagine that through the centre of the Earth passes the drilled hole. Above the hole (from one side) stands high tower, from which someone drops a stone through the hole. Stone pass through the Earth, come out on the other side of the globe and reach a certain height. It stops for a moment at that height and fly through the hole in the opposite direction, to after some time come back near the start position. This "back and forth" path, after which the stone moves, is now the whole segmental trajectory of the movement of stone and Earth relative to each other.

In nature there are no flights of celestial bodies relative to each other along the segmental trajectory. Because even if happens that two bodies will be flying directly opposite to each other, then there is no penetration, but collision and destruction of their structure. More likely is the motion along the segmental trajectory of the two fundamental particles - centrally symmetric fields. These two particles, independently of the distance between their central points, penetrate each other. This interpenetration is quite similar to the penetration of the Moon and the Earth's gravitational field or the Earth and the Sun. These celestial bodies penetrate each other, using their gravitational fields, only at very large distances. If they would move relative to each other at shorter distances, this could lead to destruction of their mutual structural construction.

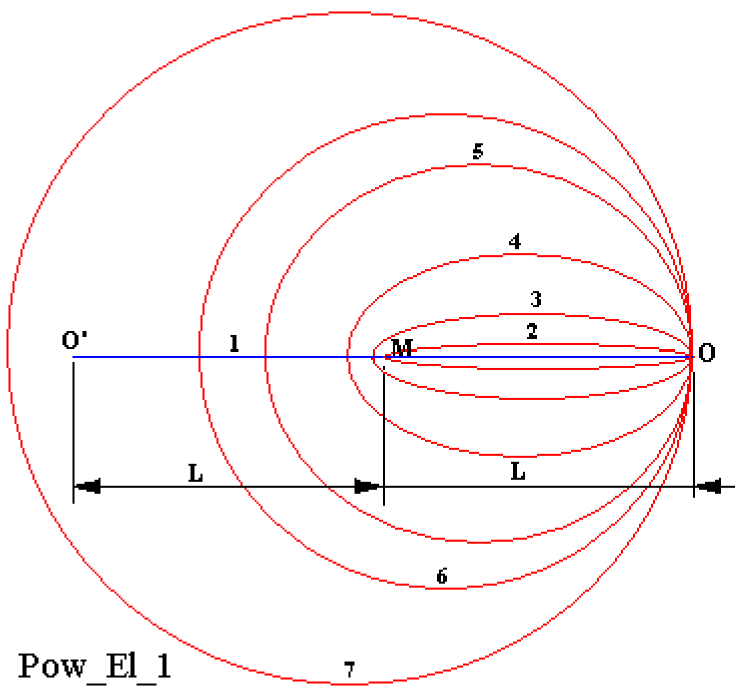
The fundamental components of matter, that is the components of all celestial bodies penetrate each other at any distance between them. They don't harm himself even at very small distances, because they don't have the structural construction, which could be destroyed.

After this brief explaining we can go to the merits. The title refers to the affinity between trajectory in the shape of the ellipse and in the shape of the segment. But, what is this affinity can be known after reading this article. Probably many people will be surprised that they didn't know yet about this affinity - despite the fact that it is so simple and obvious. But it is simple, once you know about it. In this case confirms the adage that the simplest things are the hardest to see and understand.

The elliptical shape of planetary orbits is known since the time of Kepler and Newton. According to this knowledge, after such trajectory the planets are moving and also components of the systems of binary stars. The celestial bodies are moving in that way but under the condition that other unauthorized bodies don't interfere with the movement of this elliptical trajectory.

You could say that today's physics of the gravitational interactions and astronomy treat the idea of elliptical trajectory with great confidence. Elliptical orbits are regarded as basic for the movement of celestial bodies. If sees a certain derogations from elliptical trajectories of celestial bodies, they are justified by the existence of the effect of outsiders celestial bodies. To explain derogations are also used the theory of relativity. Here you will learn that the elliptical orbits are not basic for the movement of the planets - they are rather unattainable ideal. The basic nature of the trajectories can be attributed to a completely different shape - the shape of a rosette.

The figure **Pow_El_1** shows a series of elliptical trajectories, after which it may move a hypothetical body with zero mass, around the body of mass **M**. The distance between this two objects for each of the cases is **L**. A few outlined elliptical trajectory are the hypothetical trajectories of the body **O** around body **M** at different speeds that exist in the moment of the greatest distance from each other, which is at a distance **L**. In this moment, the speed of the test body **O** relative to the body **M** is zero. However, the direction of the orbital speed of the test body is perpendicular to the segment **OM**.



Pow_El_1

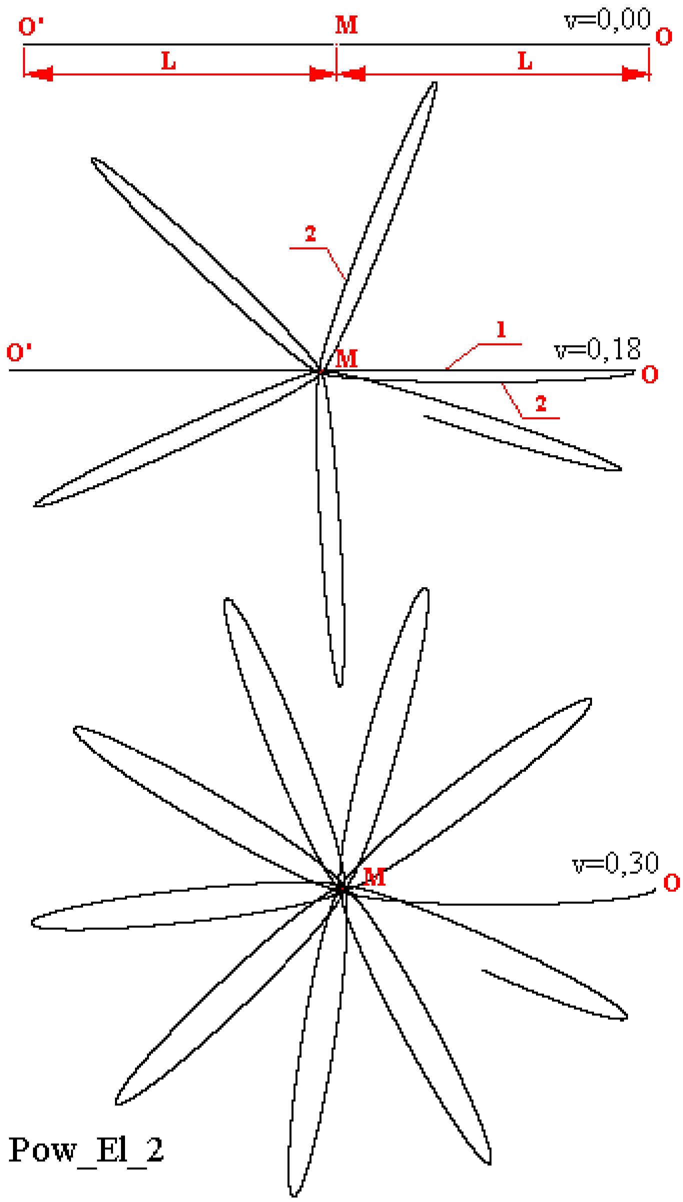
About the farthest distance between the bodies **O** and **M** can say in the case of curves with the numbers 2, 3, 4, 5, 6. Because the distance between bodies **O** and **M**, which is shown in the picture, and marked as **L**, for trajectory number 7 exists in the moment of the smallest distance of these bodies from each other (in stellar-astronomical nomenclature is equivalent periaster). Because in the case of this trajectory the initial velocity of the body **O** (in the starting point **O**) is greater than the optimum speed at which the test body moves in a circle. At initial speeds which are greater than the optimal speed, for each such experiment emerge the elliptical path, which belongs to another family, than that which interests us here. Because we are interested in the family of elliptic trajectories, for which the initial distance **L** is the maximum distance between the bodies **M** and **O** (in stellar-astronomical nomenclature is equivalent apoaster). (We will speak about the bodies referring to such bodies, which are capable of interpenetration at arbitrary distances).

If it is believed that elliptical orbits are essential for the orbital motion, may seem that such a hypothetical family of curves lines (shown in **Figure Pow_El_1**) is possible to outline by the test body **O**. It may seem that it is possible when the body will move with suitable initial velocity, at the initial position in a distance **L** from the body **M**. Considering these different situations, you can see some kind of regularity. With a certain maximum speed, the orbital body **O** will be moving in a circle with a diameter of **OO'**, in which in the centre will be located the body **M**. If at the same initial distance **L** between the bodies **M** and **O** we choose smaller initial speed for the test body **O**, can expected that the body will move through the tighter and more flatted elliptical path. So, can choose the speed of the orbiting body **O** around the body **M** that the elliptical trajectory will pass through a freely chosen point of the segment **O'M**.
Trajectories with the numbers 2, 3, 4, 5, 6 in figure **Pow_El_1** are only examples of the infinite number of possible movement paths of the body **O** around the body **M**.

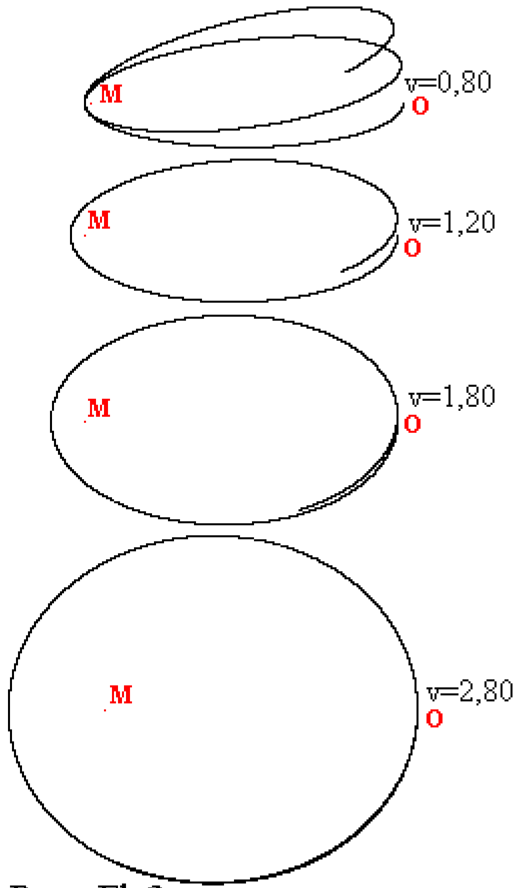
A such conclusion occurs when we believe in that the celestial bodies in the planetary systems move on the elliptical orbits, and that this type of orbit is basic for the movement of the planets.
In nature, the test body (if such exist) can't move like this. In the argumentation, mainly ensured that the trajectories are elliptical. Was fully omitted the fact that at zero orbital speed the test body will be moving on the segmental trajectory, that is, from the position **O** to position **O'** and in the opposite direction. If you forget this fact, it will not appear the question: How does it happen that the segmental trajectory, when the test body have initial velocity in the perpendicular direction to the segmental trajectory, becomes elliptical trajectory? Is this change occurs instantaneously or gradually?
If this transformation occurs immediately, it would be a very strange physical phenomenon. Because at some very low value of the initial velocity the segmental trajectory suddenly would experience some kind of collapse and don't know why it suddenly changed in a very flattened ellipse.

This very strange physical phenomenon of sudden collapse of the segmental trajectory does not occur. Segmental trajectory actually changes it's character and gradually becomes more and more similar to an elliptical trajectory and this is done relatively quickly. But this is not a sudden or one-time transformation. In the drawings **Pow_El_2**, **Pow_El_3** and **Pow_El_4** there are nine examples of the trajectory, after which the test body **O** could be moved around the body with mass **M**, at the initial (and maximum) distance between them which is equal **L**. The first is the segmental trajectory, and the next **-** this is the rosette trajectory. This shape takes the trajectory of the body **O** when has a small initial velocity of the direction perpendicular to the segment (distance) **OM**. For the reason that there is a certain initial speed, occurs deviation of the position of trajectory 2 from the position of the trajectory 1. Then, near the body **M** occurs deflection of the trajectory. But this deflection is not sufficient to create the elliptical trajectory. Instead, the trajectory is drafted in the form of rosette leaves, and then another similar leaves.

In the drawings **Pow_El_2**, **Pow_El_3** and **Pow_El_4** are shown the next gradual transition of the rosette trajectories for different cases of the initial speed of the test body in a direction perpendicular to the segment **OM**, which connects the bodies in their initial position relative to each other (in any thought, computer or theoretical experiment). With initial velocity v = 0 s.u. (speed units) the trajectory of test body has the segmental shape. With initial speed v = 0.18 s.u. the test body, before again close to it's original position, will draw a rosette trajectory with five leaves. At a speed of v = 0.30 s.u. the rosette trajectory will have nine leaves.

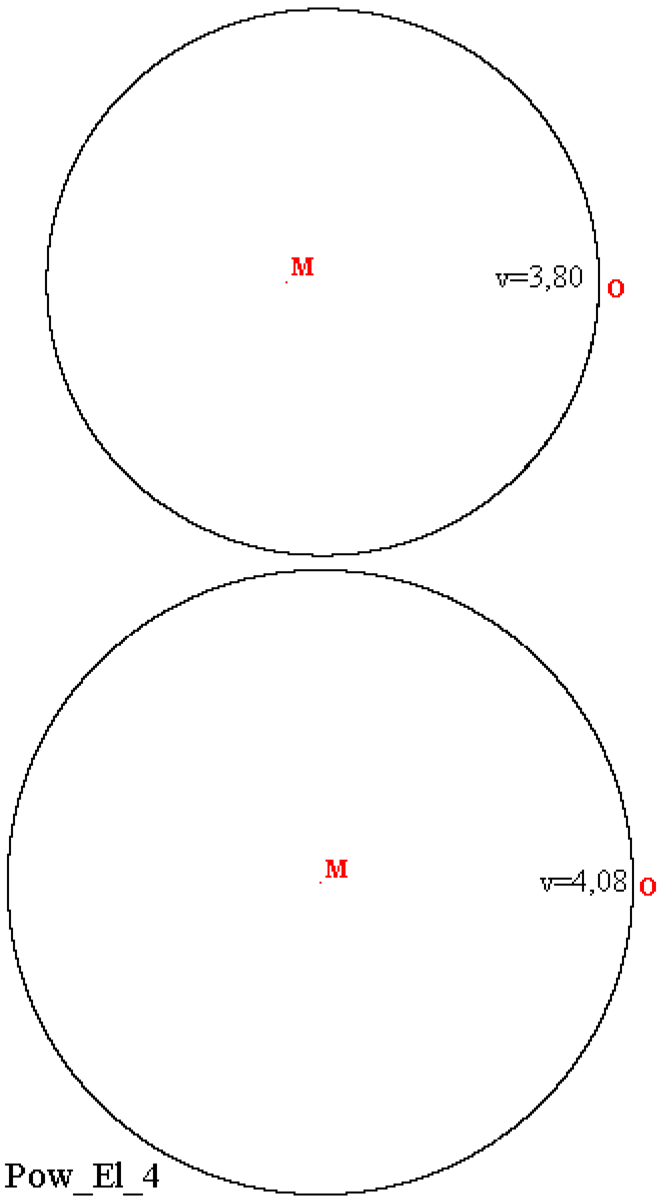


However, with increasing the initial speed, for example, v = 0.80 s.u. to v = 2.80 s.u. the rosette trajectory has more and more leaves which partially overlap one another. The shape of leaves become more and more like an ellipse, but the closure of the contour of leaf, or also the closure of the contour of ellipse, never occurs.



Pow_El_3

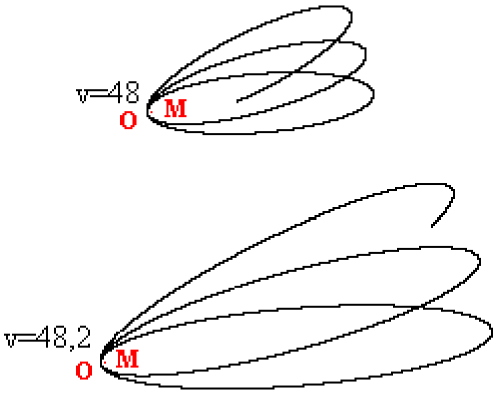
While computer drawing further such trajectories can be concluded that the ideal trajectory occurs only at that initial speed of test body when it draws a circular orbit, which is in this case the speed of v = 4.08 s.u. Only then during each of the next lap, the body moves exactly on the same circular trajectory.



Pow_El_4

As can be seen from above, the elliptical trajectory of celestial bodies in planetary systems or the systems of double stars, in fact, cannot exist. Arguments presented above relate to point bodies. In the nature celestial bodies have a certain volume, so this is still an additional factor which contributes to the fact that their orbits are different from the shape of the ellipse.

Above you see the rosette orbits which gradually change and eventually take the form of a circular orbit. Here you may get the idea that there is a possibility that the circular orbit as a result of further change, caused the increasing initial orbital velocity of the body, is converted into an elliptical orbit. Figure below **Pow_El_5** shows the two such orbits, which arose as a result of a quasi-evolutionary (described here) transformation of the circular orbit. The transformation was due to changes in speed. In the present case, the orbital speed at which the test body moves on circular orbit, is v = 33.466 s.u.



Pow_El_5

This speed was used as the initial velocity for the start (in the computer experiment) the orbital process. It was changed in one case, to the value of v = 48 s.u., in the second case was changed to the value of v = 48.2 s.u. The figure shows that even in such cases, there is no transformation of the circular orbit into the elliptical orbit. The trajectory of the test body **O** around the body of mass **M** in such cases continue to have the shape of rosettes.

Here we can end debate on the affinity of curve line at which the celestial bodies are moving. It was confirmed the existence of affinity between the trajectories of the form: segment, rosettes and a circle. In contrast, there was no evidence that the ellipse belonged to this family.

In conclusion, it should be noted that the justification of perihelion motion of the planets in the Solar System or periaster movement of stars in binary systems using the theory of relativity is meaningless. This way of justification is associated with the belief that the basic shape of the trajectory for the orbital motion of celestial bodies is the shape of an ellipse. However, as a result of these relationships, the basic shape of the trajectory for the orbital motion of the celestial bodies - the primary, because the most common - is the shape of a rosette. With this shape of trajectory is quite natural that there is periaster movement and perihelion movement. Therefore, there is no need to justify in some special way what in nature is natural and what you can logically explain.

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