THREE-BODY PROBLEM – A DECEPTION

According to 'MATTER (Re-examined)'

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Abstract: By simple mechanics, it is impossible for a free macro body to orbit around another moving macro body, in any type of closed geometrical path. However, while considering two-body problems, relative parameters of macro bodies are considered with one of them steady in space. This simple method of mathematical analysis can give accurate prediction of their future relative parameters. Orbital path of a planetary body appears around its static central body. Circular/elliptical orbits around a static central body, being an imaginary figure, has no value other than to indicate relative positions of concerned macro bodies. All macro bodies, in nature, are moving. In cases of moving central bodies (real situations) or when there are more than two macro bodies in a system, relative considerations cannot describe their orbital paths. Due to phenomenal success of solution to two-body problem by relative considerations, a firm but erroneous belief has established that all planetary bodies move around their central bodies. Adamant belief in imaginary circular/elliptical orbital path is carried forward to three-body system to create an imaginary but unsolvable problem. Three-body problem (as considered today with respect to planetary motions) is unsolvable because real and imaginary situations are mixed in it. It is nothing but a deception from reality, adopted to create a baseless mystery.

Keywords: Relative frame of reference, absolute frame of reference, planetary orbits, orbital path, apparent orbit, real orbit, two-body problem, three-body problem, multi-body problem.

Introduction:

A planetary system, with a central body, one planet and one satellite (Sun, Earth and Moon) is considered in this article. As radial movements are already accounted by curvatures of their paths, only linear motions of macro bodies are taken into account for description. Same principle of argument may be carried forward to other multi-body systems also, with appropriate modifications. Figures, in this article, are not to scale. They are depicted to highlight points presented. Term 'force' is used in its general meaning to specify 'cause of an action'. Elliptic paths include circular paths also. All conclusions expressed in this article are taken from the book 'MATTER (Re-examined)' [1]. For details, kindly refer to the same.

Relative motions:

As no absolute reference is currently available, we use relative frames of references in physics. By using a relative frame of reference, we assume certain region or a particular macro body is without translational motion (or is assumed in steady state) and use relative motions of other macro bodies, with respect to static reference, for all our purposes in mechanics. Alternative concept, advanced in reference [1], envisages a universal medium structured by matter particles, which fills entire space (outside 3D matter) without voids and encompass all 3D matter-bodies. As universal medium is normally homogeneous and reasonably static, it can provide an absolute reference for all actions and movements.

In nature, all macro bodies (except stable galaxies) have linear motion in space. Each macro body has certain inherent linear motion and corresponding magnitude of additional work (kinetic energy) associated with it. By choosing a macro body as (static) reference, in that instant, whole of its kinetic energy (associated with linear motion) is wiped-out. Simultaneously, magnitudes of kinetic energies (associated with linear motions) of all referred macro bodies are modified. Although this is an imaginary situation, it is convenient for general understanding of mechanics and mathematical analysis with respect to their relative positions. When we start assigning reality to resulting parameters, other than relative positions, it invariably distorts ensuing theories/physical laws.

Parameters of macro bodies or paths traced by them, as considered in above situation, are imaginary with respect to static universal medium. Imaginary parameters have no relation to real movements or other parameters of considered macro bodies, in space, except their relative positions. Theories or mathematical treatments, using these apparent paths (geometrical figures) of moving macro bodies, represent unreal circumstances. They can, at the most, indicate assumed or imaginary results, which may coincide with observations. They are always in relation to a steady (immobile) state of chosen reference within a system of macro bodies. These apparent or imaginary parameters cannot provide results for real physical actions.

Two independent macro bodies can be related only by their relative positions (relative parameters) in space. These are quantified by distance and relative direction between them. Relative considerations can give correct results only in determining their past or future relative positions. They are unable to provide real parameters of other states of macro bodies (size, work-done, temperature, pressure, matter content, kinetic energy, etc.) or shapes of their paths.

A moving macro body can be assumed as a static reference with respect to an observer, provided observer is assigned with imaginary motion in opposite direction at equal linear speed. By doing so, magnitude of kinetic energy of moving macro body is reduced to zero and observer is given appropriate magnitude of kinetic energy to maintain his apparent motion. Action on reference macro body's linear motion by external effort appears to produce its results on observer's apparent motion rather than on state of (motion of) reference body. In order to maintain moving macro body as a reference, it is necessary to refrain from changes in its assumed static state (of motion). All real changes in its state of motion are born by apparent motions of observer. An external effort, on observer can change his state of motion. This change is born by observer, himself.

Calculations, based on observer's apparent (relative) motion can give correct results with respect to their relative positions, for state of macro bodies within a system in same region of space. These results are true only within the system and it does not constitute physical reality. When an external effort acts on reference macro body, real action is only in change of state of (motion of) reference macro body. And when external effort acts on observer, real action is only in change of state of (motion of) observer. However, as reference macro body is assumed static, in both cases apparent changes are in magnitude of kinetic energy and corresponding state of (motion of) observer.

Real physical action by a small linear effort on observer, towards reference macro body, is to move him towards reference macro body. However, in the case considered above, apparent motion and linear speed of observer encompass both, real physical action and apparent motion, of observer. Observer apparently moves in resultant direction at resultant linear speed. Magnitude of resultant action is greatly influenced by direction of applied effort. This does not correspond to real physical action on observer.

Real physical actions can take place only with respect to an absolute reference. Only static universal medium can provide absolute reference. If macro bodies are in different regions of space with differing properties of universal medium, this type of assumption does not work well.

Linear motion of a rotating body:

Linear and rotary motions of a macro body are entirely separate. Each of them is produced by separate set of associated additional work. However, each point on a linearly moving rotating macro body has its own path of resultant motion. Motion and path of each point appear as resultant of linear and rotary motions of macro body. In figure 1, 'A' shows a rotating macro body that has no linear motion. Its centre point, O, is steady in space. Point P on its periphery traces a circular path, as shown by circle in dashed line. Let macro body develop constant linear motion, as is shown by 'B' in figure 1 and its centre of rotation moves from O_1 to O_2 at constant linear speed, while macro body turns through one revolution. Point P_1 on its periphery traces a loop as shown by the black curved line starting from P_1 and ending at P_2.

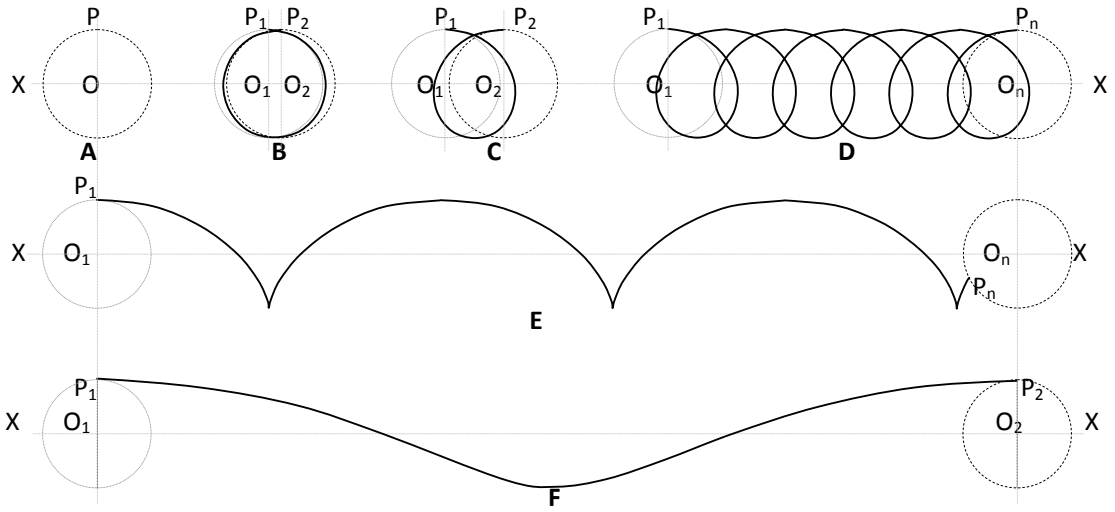

Figure 1

'C' (in figure 1) shows path of a peripheral point during one rotation of rotating macro body, moving at higher linear speed. Centre of rotation of macro body moves linearly through larger distance from O_1 to O_2, while macro body turns through one revolution. Loop traced by a peripheral point becomes narrower as linear speed increases, for same rotary speed.

Continuous loops in black from P_1 to P_n in 'D' (in figure 1) shows continuous path traced by peripheral point in space, while centre of rotation of rotating body moves linearly from O_1 to O_n along line XX. As linear speed of macro body increases in relation to its rotary speed, loops in path of peripheral point gradually becomes narrower until loops disappear altogether at a stage.

At this stage, macro body's linear speed equals π times its radius (distance of peripheral point from centre of rotation) per unit time (during every rotation of macro body). Black series of semi-circular paths 'E' (in figure 1) shows curved path traced by a peripheral point. Resultant path of peripheral point consists of semi-circular curves with their convex sides in same direction. Path of peripheral point starts from P_1 and advances to P_n, while centre of rotation of rotating macro body moves linearly from O_1 to O_n along line XX.

As linear speed of rotating macro body exceeds this value, no points in it have motions in reverse linear direction. All points in macro body have displacements only in forward direction. Requirements that points in a rotating body on opposite sides of centre of rotation have displacements in opposite directions are no more satisfied. No point in macro body has circular or elliptical path in space. All points in macro body move in forward linear direction only. However, with respect to any point in macro body,

all other points in its plane of rotation, appears to move in circular path around the point of reference.

As linear speed of rotating macro body increases, circular path of peripheral point expands to become a wavy path about line of motion of macro body's centre of rotation, as shown by black curved line, 'F', in figure 1. Path of peripheral point in space traces a wavy curve from P_1 to P_2, while centre of rotation moves from O_1 to O_2 along line XX, during one rotation of macro body. At lower linear speeds, difference between segments of curved path (on either side of linear path) is large. As linear speed of rotating macro body increases (for same rotary speed), lower segment becomes larger and differences between upper and lower segments of curve reduce.

Although, depending on macro body's linear speed in relation to its rotary speed, a peripheral point traces curves of loops (semi-circular curves or wavy path) in space, it still moves in a circle with respect to centre of rotation of macro body. Motion of peripheral point in circular path is apparent only to an observer situated at centre of rotation of rotating macro body. Circular path of a peripheral point, noticed by observer, is an illusion due to his inability to consider his own linear motion in space. In fact, every point in rotating macro body, moving in linear path, appears to move around every other point in same macro body. This is false impression, created by choosing a moving point and assuming it as a (steady) reference. Every point in rotating macro body has its own independent path in space. Except when rotating macro body has no linear motion, paths of peripheral points do not trace closed geometrical figures in space.

Since both apparent motions of peripheral point in circular path around centre of rotation and centre of rotation in circular path around peripheral point are illusory; no true physical law can be based on them. Such illusions cannot be considered as proof of scientific laws. Observers, situated at both these points have simultaneous apparent motions, contrary to each other. None of them can observe true motion of their points on rotating macro body, in space. Real path of any point on linearly moving-rotating macro body can be viewed only from external point. Origin of frame of reference has to be outside the macro body.

A rotating macro body's integrity maintains relative positions of its peripheral points with respect to centre of rotation. Integrity provides certain attachment between these points. All through their displacements, distance between centre of rotation and a peripheral point remains constant. Each of these points can appear to move in circular paths around other point. Therefore, in any system of macro bodies, where distance between reference and referred macro bodies is maintained constant (by some means irrespective of their motions) and where each macro body appears to move in circular path around the other, above given explanations are valid.

Orbital motion:

A planetary system is formed by a group of large macro bodies in space. Macro bodies of this group move together along a median path, while individual macro bodies have independent relative motions within the group. Planetary system that includes sun and its planets is solar system. Path of each macro body in this system is affected by presence of all other macro bodies. As they are very small, we may for the time being, neglect effects on their paths by presence of other macro bodies. There may also be smaller macro bodies called satellites in a planetary system. Satellites, being very near to planets, form (sub) planetary system with their mother planet, within larger planetary system. Largest macro body in the group has its path nearest to median path and its path is least perturbed. This macro body acts as leader of the group and it is called central body of planetary system. All other macro bodies, in planetary system, move along with central body, while their paths are perturbed by presence of all other macro bodies in the system.

For explanations below, we shall consider a planetary system containing a central body and one planetary body. A planetary system is essentially a part of a galaxy. All stable galaxies are static in space [1]. Galaxies are rotating systems of macro bodies with no translational motion. Hence, a planetary system in a stable galaxy traces a path around galactic centre. Median path of a planetary system is very large around galactic centre.

With reference to a planetary body, central body appears to orbit around planetary body and with reference to central body, planetary body appears to orbit around central body. Disregarding eccentricity of orbit, distance between central body and planetary body remains constant. By these characteristics, a planetary system functions as a linearly moving rotating macro body. Planet takes the place of a peripheral point and central body takes the place of centre of rotation, in explanation given above. Median path of a planetary system is a very large circle. A very small part of this large circle may be considered as a straight line for this explanation.

Real orbital path:

With respect to absolute reference, a planet does not orbit around its central body [1]. Path of planet is wave-like, along central body's median path, with planet periodically moving to front and to rear of central body. In figure 2, path of central body is shown by grey arrow in curved line. This curved path, also, is wavy to a smaller extent, curving in same directions as path of planet. Arrow in black wavy-line shows planet's orbital path. Unevenness of curvature of this path on either side of central body's path (in

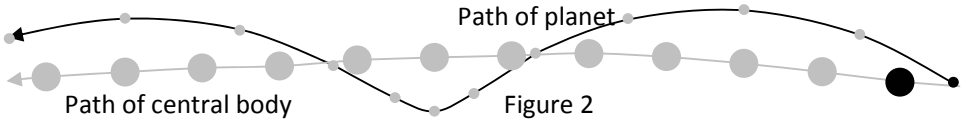

Figure 2

the figure) is due to different scales used linear and radial displacements. Path of a satellite is a wavy-line about planet's path. Central body and planet are shown by black circles and their future positions are shown by grey circles. In this sense, it can be seen that a planet (or a satellite) orbits around centre of central body's curved path and wave pattern in its path is caused by presence of central body. In reality all macro bodies in planetary system (including satellites) are free and they have their own individual paths in space. Changes in path of a free macro body are due to perturbations caused by presence of nearby macro bodies. These perturbations look like orbital motion around a central body, only when they are referred to assumed static central body in a relatively small system of macro bodies. This argument can be carried further to show that with respect to absolute reference there is no natural orbital motion around central bodies at all, except orbital motions of macro bodies around (static) galactic centres [1].

As a planet moves in its orbital path, its relative direction to central body changes through half a circle, alternately in either direction. This is in contrast with present assumption of a planet moving around central body in full circles (an assumption created by change of reference frame). Changes in relative direction between macro bodies cause variations in efforts and their actions.

Both, planet and its central body, move in same direction about same median path in space. Acceptance of wavy-nature of planetary orbital paths can give simpler and logical explanations to many of the puzzling problems in cosmology, like; formation of planetary system, coplanar locations of macro bodies in a planetary system, mechanism of planetary spin, higher spin speeds of equatorial region of certain planetary bodies, displacements of tides from local meridian, precession of elliptical apparent orbits, apparent lengthening of solar days, etc [1]. All assumptions, based on elliptical nature of planetary orbits are invalid.

Apparent orbital path:

All planets in solar system would appear to an observer (on static sun) as orbiting around sun. Similarly an observer in any of the planets would observe all outer planets and sun orbiting around him. Standing on earth, we see that sun, outer planets and moon orbit around us in complicated geometrical paths. All these orbital motions are mere appearance. Elliptical orbital motion is apparent only with respect to participating macro bodies.

Apparent planetary orbits can be assumed around any reference point, within a system. Since we consider instantaneous parameters of planets, for most of all practical purposes of predictions (of annually) re-occurring phenomena, apparent orbits (relative positions) provide accurate results. Although most astronomers are aware of apparent nature of elliptical orbital paths, they still seem to consider

apparent orbit as true orbital path of a planet. Kepler's laws on planetary motion and elliptical planetary orbits are routinely used in conjunction with many multi-body problems including moon's orbital path, which was not considered for in original planetary laws. Although mathematical treatments of apparent actions may produce results that suit apparent phenomena, they cannot always describe real facts.

A planetary body moves in same direction and along with its central body. It is only when we imagine reversing direction of planet's motion on one side of central body's path; we can get a geometrically closed figure for planet's apparent orbital path. This is something we unintentionally do. It coincides with our observations and general beliefs. It is a good assumption to have definite reference points on planetary orbital paths, to predict cyclically varying phenomena. Even with these manipulations, shape of an apparent orbital path is oval with a single focus rather than an ellipse with two foci [1].

Apparent orbit is a small part of larger real orbital path, between two identical appearances of central body, looking from planet (e.g.: one solar year). It is an imaginary concept, where shape of path, speed of planet and directions of motions are manipulated to suit observations. As such, it has no logical basis. It depicts appearance of a system, where central body is assumed stationary by some imaginary mechanism (change of reference frame) at the centre of apparent orbit and planet moves at a (constant) linear speed by an equally imaginary mechanism.

Only cause of actions within a planetary system is 'central force', due to gravitational attraction, which accelerates planet towards centre of apparent orbit – the central body. Parameters of this action are mathematically manipulated to produce required orbital motion around central body that matches observations. While doing this, much greater motions of planetary body before it became a planet and motion or path of central body are ignored. An apparent orbit is convenient to predict cyclic features that take place annually. However, taking an apparent orbit as path of real motion of a planet is highly illogical and incorrect.

Apparent orbits, determined by using (static) barycentre method, are also circular paths around centre of mass of two macro bodies. Even relativistic mechanics subscribe to planetary orbital paths around central bodies. It suggests curvature of space near a very large macro body as the cause of planetary orbits rather than an attraction between planetary and central bodies.

Figures 3 compares real path of an orbiting body and its apparent orbit for duration of one apparent orbital period, according to Kepler's laws of planetary motion. Grey central line shows central body's path. Black, wavy line is path of planet. Larger black circle shows central body and circles in dotted line show its future positions. Small black circle shows planet and grey circles show its future positions. Double headed arrows show 'central force' between them at various positions as they move along their paths. As planet moves, its apparent orbit moves along with central body.

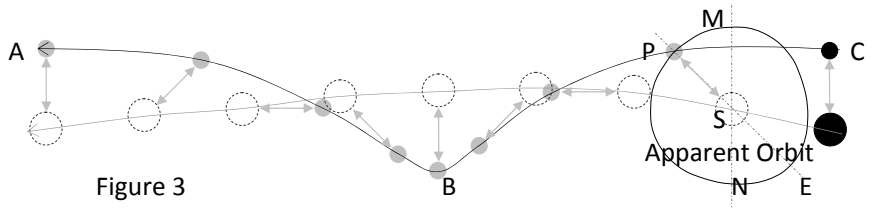

Figure 3

Apparent orbit of planetary body, when it is at position P with central body at S, is shown by the oval in figure 3. Planet's perihelion is at P and aphelion is at E. In real motion, highest and lowest linear speeds of planet occur, when it is at 90° away from path of central body, at M and B, respectively. All parameters of apparent orbit and orbiting motion are related to perihelion and aphelion. From its position at C, until B, planet is in front of central body and hence it is retarded in its linear motion. From B to A, planet is behind central body and hence it is accelerated in its linear motion. Line MSN (extended) is radial line connecting central body to centre of its curved path (galactic centre). Acceleration and deceleration of planet change over at points M and B. These points are fixed relative to path of central body.

Three-body problem:

Derivation of apparent orbit for a system, that has two macro bodies in it, is understood as 'two-body problem'. From above explanations; an apparent planetary orbit is an ellipse around its central body. Description of apparent orbit of a planet around its central body (in a system of two free cosmic macro bodies, where the system as a whole has no translational motion in space) is based on definite requirements (as assumptions). They are summarized below, in conjunction with their unsuitability for three or (n)-body problem.

If a system has more than two macro bodies in it and we wish to simultaneously derive apparent orbits for each of them, it is called a three or (n)-body problem. Despite above given definite assumptions for specific purpose of two-body problems, many physicists carry forward same assumptions while attempting solve three or (n)-body problems. This is very much against requirements elicited above for two-body problem.

1. There are only two macro bodies in consideration.

   As there are more than two macro bodies in a system, methods used for two-body system cannot be used for three or (n)-body problems.

2. Central body of planetary system or barycentre of macro bodies is stationary in space.

   Each apparent orbit has a stationary central body. As central body moves, apparent orbit also moves along with it in space. Hence, at least one macro body in three-body (or more bodies in n-body) problem has to act simultaneously as static central body as well as moving planetary body. This is an impossible goal.

3. In Kepler's method, only a planet traces apparent orbit. In barycentre method, both, central body and planet have apparent orbits around their 'centre of mass'.

   While apparent orbits of all planets in a planetary system are with respect to same central body, in barycentre method, each planet has its individual apparent orbit and it is derived from separate sets of parameters. Hence each pair in a three or (n)-body system has to have separate central bodies. This requirement is not fulfilled. Although many macro bodies may have single centre of mass, barycentre, used for apparent orbit, is the point between two macro bodies (where they balance each other) around which both macro bodies orbit about each other. This function cannot be fulfilled in case of systems with more that two macro bodies.

4. There can be only one central body in a planetary system. Other macro body (bodies) is (are) planetary body (bodies) that traces apparent orbit(s).

   As there are more than two macro bodies in a three or (n)-body system, two or many central bodies are required in the system. This is another impossible goal.

5. Apparent orbit is derived from relative parameters of a planet with respect to its central body.

   As there are more than two macro bodies in a three or (n)-body system, planets and satellites cannot have relative parameters (required for apparent orbit) with same central body.

6. Direct relation is only between two objects.

   Relation of a third object can be established indirectly through its separate direct relations with other two objects. Hence, a third macro body (in three-body problem) can not have apparent orbit with two other macro bodies, simultaneously. Search for one apparent orbit about two central bodies can not yield results.

Almost none of the requirements, for deriving apparent planetary orbital paths in two-body problem are fulfilled in proposed three-body problem. Unless three-body problem has its own set of requirements and a special method to derive apparent orbits of member macro bodies, no such problem can exist, in current state of physics. However, creating fictional problems and solving them by mathematical manipulations is often appreciated by scientific community. Perseverance on the part of many scientists to find a mathematical solution to this non-existent problem yielded no comprehensive results yet. Raising a non-existent problem and qualifying it as 'unsolvable problem' or 'unexplainable physical

phenomenon' is an attempt to mystify physics. Mysterious aura about physics may appeal to many, so that the subject is reserved for few and others are compelled to believe in its divine nature.

Unlike apparent planetary orbits, real orbital paths require no assumptions. Hence, real orbital paths of any number of macro bodies may be derived from their true parameters. Only difficulty to derive real orbital path is to specify initial conditions accurately, without an accepted absolute reference. Until we can define an absolute reference, apparent planetary orbital paths, derived by considering relative parameters (which help to predict cyclic events) may be used to specify their relative positions and associated phenomena. However, it may be borne in mind that apparent orbits give accurate results only with respect to relative positions of macro bodies in a planetary system and nothing else.

Conclusion:

Assumptions used to derive apparent planetary orbital paths in two-body problem are unique for it. They are not suitable, when number of macro bodies in planetary system exceeds two. As long as a set of assumptions is not defined, separately for deriving apparent orbits in planetary systems that has more than two macro bodies, three-body problem cannot exist. Assertion that non-existent three-body problem exists and declaring it as an 'unsolvable problem in physics' is a deception to mystify physics.

Reference:

[1] Nainan K. Varghese. *MATTER (Re-examined)*, http://www.matterdoc.info

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