

# INERTIA

According to 'MATTER (Re-examined)'

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*Abstract:* Inertia is a property that causes macro bodies to respond sluggishly to external efforts. Since no other entity that can prevent instantaneous action by external efforts on a free macro body or maintain its constant state of motion is known, phenomenon of inertia is usually attributed to matter itself, in negative sense. 3D matter is inert; it has no ability to move, act or oppose external efforts. Property of inertia rightly belongs to universal medium, whose action moves 3D matter-bodies. Property of inertia is due to latticework-structures in universal medium. Only when mechanism of action of external effort and mechanism of motion of 3D matter-bodies, as envisaged in the book 'MATTER (Re-examined)', are understood, nature of inertia will be clear.

*Keywords:* Inertia, universal medium, effort, force, motion, work, matter, photon.

## Introduction:

Alternative concept, presented in the book 'MATTER (Re-examined)', envisages a universal medium formed by 2D latticework-structures (called 2D energy-fields) by quanta of matter. 2D energy-field, formed separately in each plane has independent existence and extends infinitely in all directions in space. All possible spatial planes have one 2D energy-field, each. Together, they create an all-encompassing universal medium with definite structure and properties to fill entire space. They are inherently under compression. Action creates or introduces distortions in latticework-structures of 2D energy-fields. Reaction from distorted latticework-structures tends to restore homogeneity of 2D energy-field. Due to inherent stability of 2D energy-fields, distortions in universal medium are transferred in the direction of action. All 3D matter-bodies exist in universal medium, which is in direct contact with every basic 3D matter-particle. A 3D matter-particle, which happens to be in the region of distortions in universal medium that are being transferred, is carried along with distortions. All conclusions, expressed in this article, are taken from book, 'MATTER (Re-examined)' [1]. For details, kindly refer to the same.

## Inertia:

By the law of inertia, deduced from his experiments with balls rolling down inclined planes, Galileo was able to explain how it is possible that we do not sense motions of earth. Since we are in motion together with earth and our natural tendency is to retain that motion, earth appears to us, at rest. Newton's first law is known as the principle of inertia. According to this law, depending on its initial state of motion, '*a body with no net force acting on it will either remain at rest or continue to move with uniform speed in a straight line*'. Distinction between states of 'rest' and 'uniform motion in a straight line' is only superficial. They may be regarded as same state of motion seen by different observers; one moving at same velocity as moving body, the other moving at constant velocity with respect to moving body. [We should also note that no macro body can remain static in space]. Historically, we may consider

that this principle of inertia is the starting point and a fundamental assumption of classical mechanics. No logical cause or mechanism of action could be provided for this peculiar behavior, associated with macro bodies. Hence, this behavior was simply assumed as a property of the most obvious entity that could be observed – the matter.

Inertia is an observed tendency, attributed to matter-bodies. It needs not be a property of matter. Matter-bodies appear not to respond instantaneously to action of an external effort. This delay is not necessarily due to any property of matter-body. However, since no other entity that can cause such delay in action of an effort is observed, property of inertia is attributed to matter-body (which is under action) without any logical basis. While considering motion in circular path, pseudo ‘centrifugal force’ is often thought as caused by inertia of moving macro body. In some other cases, it is proposed that gravity and inertia are always working simultaneously against each other, and in proportion to object's ‘mass’. Einstein reinforced the relationship between gravity and inertia by declaring their equivalence.

The word ‘inertia’ is related to word ‘inert’, which means ‘*without inherent power of action, motion, or resistance*’. In physics, inertia is defined as ‘*property of matter by which it continues in its existing state of rest or motion unless an external force is applied*’. Inertia is characterized by a matter-body’s ‘heaviness’ or its lethargy to move. This is not a property of matter because matter cannot act or move by itself but it is only an attributed property of matter. All 3D matter-bodies are inert. Hence, it is incorrect to assume 3D matter-bodies interact between themselves. Every action has to have a cause. Motion of a 3D matter-body is an action and it has to have a cause. Since 3D matter is inert, a macro body cannot cause its own motion or inertia associated with it. Macro bodies need an agency to act on them or to produce apparent interactions between them. This agency is external to 3D matter-bodies and acts as an intermediary agency between apparently interacting macro bodies. In fact, intermediary agency acts on each of the macro bodies separately and the result of simultaneous actions on different macro bodies, when considered together, appear as interaction between them.

### **Nature of inertia:**

An entity may have number of properties or qualities. One or more of its properties or qualities may describe this entity. However, an entity may also be indicated by a quality or property it has not. Quality or attribute is a functional character, an entity has. A character that is absent from an entity is not one of its quality. Inability to move or act is not a characteristic property. Hence, inertia, taken in above sense, is not a property of an entity. It describes some property the entity does not have. It is describing a property in negative sense.

An external agency is required to move a macro body. If this external agency has ability to move macro bodies, property that causes delayed action is one of this external agency’s qualities. A property of macro body, expressed in negative sense, can mean a property of external agency, expressed in positive sense. Thus, inertia can mean a property of external agency to cause delay in motion (or change in rate of motion) of a macro body.

Inertia is a passive property. It can only oppose efforts (‘forces’ or ‘torques’) by active agents. A macro body moves at a constant linear speed not because of its inertia but only because of absence of effort by external agency to slow it down, change its course, or speed it up. Inertia appears or is present only during a change in macro body’s state of motion. Inertia does not act on macro body in any manner. Cause of motion does not affect development or magnitude of inertial measurements. Whichever natural phenomena or effort (natural force) cause macro body’s motion, development and magnitude of measurements related to inertia are same.

In physics, quantitative measure of inertia is considered as a fundamental property of all matter. It is so, by virtue of which a macro body opposes any agency that attempts to put it in motion or (if macro body is already moving) to change magnitude or direction of its linear or rotational velocity. Inertia is a passive property that does not enable a macro body to do anything except oppose such external active agents. Inertia is ‘resistance’ that a macro body appears to offer to a change in its speed or position upon application of effort (force). Even though, macro body does not or cannot do anything to offer or change this resistance, this behavior – observed with respect to its motion – is attributed to 3D matter-body, for

lack of another observed external agency.

If it is appropriate to understand inertia as a property that invokes resistance to change of state of motion of 3D matter-body, the word 'resistance' acquires special significance. Resistance is developed during relative motion between (at least) two entities in contact. This implies that 3D matter-body, during its change of state of motion, has relative motion with respect to another entity, which is in direct contact with it. And during its constant state of motion, 3D matter-body experiences no inertia. This implies that during constant state of motion, there is no relative motion between it and external agency.

In order to understand true nature of inertia, it is necessary first to understand nature of external agency that moves 3D matter-bodies and mechanism of motion. Mechanism of motion of 3D matter-body includes mechanism of action or application of effort (work). This was always a mystery. By logical consideration, no 3D matter-body can move on its own. It was also not logical to consider that a 3D matter-body can affect state of motion of another, without making direct contact. Yet in nature, 'action at a distance' is observed and efforts ('forces') appear to act on 3D matter-bodies through empty space. Only logical conclusion is that there is an unobservable intermediary agency between (apparently) interacting 3D matter-bodies.

In the past, many intermediary agencies or media, like; different types of aethers, diverse fields, etc. were proposed. Being very vague, none of them stood scrutiny for long time. Although each of them had characteristic properties to suit corresponding (mathematical) theory, for which it was proposed, none of them had rational constituents or logical structure. Although, existence of intermediary medium is not acknowledged any more, we do use many entities (like; various undefined fields, mysterious imaginary particles, form-less and structure-less entities, mathematical constructs, etc.) to facilitate mathematical understandings and coherent (?) explanations of various phenomena. This only indicates dire necessity for a logical all-encompassing universal medium, structured by real entities. Since no logical external agency could be theorized or accepted, so far, mechanism of action continues to remain a mystery. Therefore, we were compelled to assign property inertia, which rightly belongs to unobservable (and undefined) external agency, to observable 3D matter-bodies in negative sense.

Alternative concept, presented in book, 'MATTER (Re-examined)', proposes a universal medium that fulfils all requirements, needed in various theories. Whole of the concept is based on a single assumption that 'Substance is fundamental and matter alone provides substance to all real entities'. Universal medium has only one type of real matter-particles as its constituents – quanta of matter. Inherent properties of quanta of matter help them to logically structure a universal medium that fills entire universe, outside basic 3D matter-particles. Universal medium is a combination of 2D energy-fields in all possible planes in space. 2D energy-fields have quanta of matter as their constituents and definite latticework-structures. All actions on or by macro bodies and apparent interactions between them are results of inherent property of latticework-structures of 2D energy-fields to attain homogeneity and serenity. Acceptance of universal medium can remove all mysteries, present in physical science today.

Distortions in 2D energy-fields, associated with macro body, are work done about it. Changes in associated work changes state of motion of macro body. Distorted region in universal medium, in and about a macro body, is its 'matter field'. Inertial delay is caused by the time required for stabilization of distortions in matter-field during variation in magnitude of additional work about a macro body. Additional work, done about a macro body, is the magnitude of 'additional distortions' in its matter-field, which determine its state of motion. 'Intrinsic distortions' about matter-field are work, done to cater for development of macro body and sustenance of its stability and integrity.

### **Measurement of inertia:**

Depending on type of macro body's motion (linear or angular); inertia is numerically determined in two scales. Resistance offered to change in macro body's state of motion may be quantified in terms of external effort on it and change in its state of motion. Magnitude of resistance may be understood as equivalent (not equal) to magnitude of action associated with macro body that invokes inertia. There are two types of numerical measures of action that invokes property of inertia.

Inertia of a macro body, in relation to its linear motion, is its 'mass'. A macro body's 'mass' governs its resistance to action of external effort (force), acting in a direction through centre of macro body's matter-content. Since magnitude of resistance is proportional to magnitude of its matter-content, mass of a macro body is generally understood to represent magnitude of its matter-content. Note that mass and effort are defined on mutual basis – by circular logic. Both, inertia and gravitational attraction, have nothing to do with mass of macro body, which is a mathematical relation between external effort (force) on it and its acceleration. Therefore, differentiation of inertial measurements into 'gravitational mass' and 'inertial mass' is arbitrary.

A macro body's 'moment of inertia' or 'rotational inertia' about a specified axis measures its resistance to action of an external effort (torque) about same axis. This axis could be through or outside rotating macro body. Greater the mass or moment of inertia of macro body, smaller is the change produced by action (by applied effort). Moment of inertia of a macro body about an axis is the sum of moments of all its 3D matter-particles, about the specified axis. Magnitude of moment of inertia depends not only on matter-content of macro body but also on parameters of axis chosen. For same macro body, depending on axis chosen, different magnitudes of resistance may be exhibited.

In mechanics, generally, relative reference frames are used to describe actions. In this, a static macro body is assumed as reference in space and relate motions and locations of all other macro bodies with chosen reference. Displacement of reference point/body (or an action on it) is automatically assigned to referred-bodies (in opposite direction) instead of displacement of reference-body. By assuming reference-body as stationary and taking relative motions of referred-bodies as true parameters, their true parameters and movements are greatly altered. Use of altered parameters to determine physical actions by/on macro bodies result in incorrect parameters and false shape of their paths.

Method of relative reference frame is very simple and gives accurate results for relative positions of corresponding macro bodies. However, this method can give only apparent results for all other parameters of corresponding macro bodies. For identical changes in states of motion of referred and reference-bodies by actions of external efforts, no inertial effects are obtainable on referred macro body. Although external effort has acted on referred macro body, its state of motion does not indicate change. Hence, only actions, considered with respect to an absolute reference can give real parameters and correct shapes of paths of various macro bodies considered. As universal medium, provided by 2D energy-fields, is moderately static and homogeneous, it can provide an absolute reference. Inertial measurements of a macro body are affected by the use of its apparent parameters, with respect to relative reference frame.

### **Inertial motion:**

Displacement of a macro body in space that gives rise to phenomenon of inertia is envisaged as 'inertial motion'. Any action that results in displacement of macro body in space is inertial motion. Action of effort on a macro body results in additional work in its matter-field. Mathematical relationship between variation in rate of change of displacement (acceleration) and matter content of macro body (represented by its mass) is 'force'. Hence, action of effort (or force) is changes in or development of additional work about a macro body. As long as macro body keeps its stability and integrity, intrinsic work, associated with it, does not change. Hence, we will not consider intrinsic work associated with macro body, in this article.

Causes and mechanisms of motions of macro bodies have logical explanations [1]. 2D energy fields in universal medium are the moving-agencies of a macro body and mechanism of motion is entirely a part of universal medium's inherent property to strive towards absolute homogeneity. Deformation or transfer of distortions in latticework-structures of 2D energy fields displace basic 3D matter-particles, floating in them. As mechanism of motion is fully contained in universal medium, inertia becomes its property. Once, inertia is considered as a property of universal medium, mass of a macro body becomes the measure of ability of universal medium to cause motion or change of rate of motion of macro body. Since measure of this ability (in case of linear motion) is related to matter-content of macro body, it can be considered to represent quantity of (material) matter, in macro body, under static conditions.

During creation of basic 3D matter-particles (from disturbance in universal medium [1]), surrounding universal medium is distorted by gravitational actions. Shape of basic 3D matter-particle causes differences in distortion-density in surrounding universal medium. Universal medium tend to equalise distortion-densities by transferring distortions from regions of high distortion-density to regions of lower distortion-density. During transfer of distortions, basic 3D matter-particle is also moved along with distortions and causes its linear motion at the highest possible speed – linear speed of light – and spin speed proportional to its matter-content. Basic 3D matter-particle, created by universal medium, and associated distortions around it, together, form a corpuscle of light – a photon [1].

Linear speed of photon (light) is limited by ability of universal medium to move its constituent quanta of matter, without its own structural breakdown. Absolute linear speed of photon remains constant, irrespective of any other action on it. As linear speed of photon cannot be modified, it does not qualify as inertial motion. Therefore, inertial laws are not applicable to motions of photons.

If action of external effort tends to affect photons' linear speed along their (curved) paths (instead of causing sideways displacement), in any way, it may cause photons to gain or lose (energy and) matter-contents. If the action tries to slow down photons, they lose (energy and) matter-content and lower their frequency. This process is heating. Matter/energy contents, lost from photons may form new photons and radiate away from hot body. If the action tries to speed up photons, they gain (energy and) matter-content from surrounding universal medium and raise their frequency. This process is cooling. Currently, heating and cooling are not considered as inertial actions.

Photons form all other superior 3D matter-bodies found in nature. While they are part of superior 3D matter-particles, photons are confined to move in circular paths, within corresponding primary 3D matter-particles. Critical linear speeds of photons are maintained in their curved paths even when they are part of fundamental particles/macro bodies. Depending on distortion-density on either side of curved path of its linear motion, a photon may also simultaneously move sideways by transfer of distortions in that direction. Actions by universal medium move a macro body by displacing its primary matter-particles sideways without affecting constituent photons' critical linear speeds.

Sideways displacements of photons, along with superior matter-particles/macro body, are bound to produce additional distortions in surrounding matter-field, which correspond to displacement of macro body. Once produced, additional distortions tend to be transferred in straight line, indefinitely at constant velocity through universal medium. Constituent 3D matter-particles of macro body move along with them. This process of motion continues until additional distortions in matter-field of macro body are removed or varied in magnitude by another set of additional distortions.

Development of distortions in universal medium necessitates displacements of constituent quanta of matter in latticework-structures of corresponding 2D energy fields. Displacements of quanta of matter and hence, development of distortions in universal medium are work done. Distortions in universal medium strain inherently stable latticework-structures to produce stress in them. Stress in universal medium is 'energy' associated with work (distortions). Since energy is proportional to work, they may be considered synonymous. Work being a real entity and energy being its shadow, 'energy' is a functional entity. Energy has no independent existence. Transfer of work (distortions) in universal medium is synonymous with transfer of energy.

Displacements of constituent quanta of matter in universal medium to produce distortions (work) take time to accomplish. Hence, work is done slowly and progressively by an effort. No inertial effort can act instantaneously. Additional work, done in macro body's matter-field needs time to rearrange and stabilise structural deformation in latticework-structures of 2D energy-fields. During this time, macro body is under acceleration/deceleration stage. By the time, additional work in macro body's matter-field is stabilized; macro body's acceleration/deceleration period is complete. [The fact that acceleration and deceleration period is essential for stabilisation of additional work, irrespective of continued action of external effort, is often overlooked]. Thereafter, macro body is carried at a constant linear velocity by distortions, being transferred through universal medium.

Additional distortions in matter-field of a macro body can also be supplied by inertial action by

another macro body. Let us consider a moving macro body 'A' making contact with a static (or slower moving in same direction) macro body 'B'. Presence of macro body 'B' restricts free motion of macro body 'A', as dictated by additional distortions in its matter-field, moving in universal medium. However, 3D matter-particles of macro body 'B' cannot restrict additional distortions in matter-field of macro body 'A', from encroaching into their own space. Part or full of additional distortions, associated with macro body 'A', advance into space occupied by macro body 'B'.

As additional distortions continue to be transferred through space, occupied by macro body 'B', its 3D matter-particles also are carried along with additional distortions. Motion of macro body 'A' is now transferred to macro body 'B', partially or in full. If whole of additional distortions in matter-field of macro body 'A', is transferred into space occupied by macro body 'B', macro body 'B' moves at linear speed corresponding to additional work (energy), it received from macro body 'A' and macro body 'A' comes to a stop. If transfer of additional distortions is partial, both macro bodies continue to move at linear speeds corresponding to additional work (energy) associated with each of them. Additional work (energy) lost from matter-field of macro body 'A' is equal to additional work (energy) gained by matter-field of macro body 'B'.

For transfer of inertial motion from one macro body to another, it is essential that 'force-receiving body' is moving at slower linear speed compared to 'force-applying body'. If 'force-receiving body' is already moving at highest possible linear speed through universal medium, no additional distortions, in the direction of its motion, can be transferred into its matter-field. This is because speed of transfer of distortions cannot exceed the highest linear speed, permitted in universal medium. In such cases, mass of 'force-receiving body' reaches infinite proportions. This requirement of lower linear speed of 'force-receiving body' restricts efficiency of applied effort on a macro body, in the direction of its linear motion and causes phenomenon of 'relativistic mass'.

2D energy-field, in each plane, is structured into latticework formation. Additional work about a moving macro body, in the form of additional distortions in it cause latticework-structures to compress in the direction of motion of macro body, by certain magnitude, proportional to magnitude of macro body's linear speed. As this compression is in linear direction, it helps latticework-structures in macro body's matter-field to reduce in length (in the direction of its linear motion) and expand in perpendicular directions of its linear motion. Macro body as a whole contracts in length (in the direction of its linear motion) and expand in planes perpendicular to direction of its linear motion. Magnitudes of these contractions in length and expansions in girth are proportional to its linear speed.

Should direction of transfer of additional distortions and direction of motion of macro body are not co-linear, transfer of additional distortions can affect macro body only as long as it is in the path of moving additional distortions. Thus, planetary bodies moving in orbital paths about a central body experience higher 'central force' towards their rear ends compared to their forward ends. Centre of gravity of a free orbiting planetary body shifts to rear from centre of its matter-content. This phenomenon causes accelerating spin motion of planetary bodies in the plane of their orbital path.

Irrespective of their nature of action (electric, magnetic, nuclear, mechanical, etc.), all actions are understood by inertial motions of 3D matter-bodies, they produce. Force, being a (mathematical) relation between rest mass of a macro body and rate of change of its speed (due to effort), is identical in all cases of actions. Hence, there is no meaning in differentiating efforts into different categories, depending on the phenomena producing them. All efforts and their actions in nature are similar. Only differences are in phenomena producing them. Hence, fundamentally, there is only one type of effort (force). Different manifestations of efforts are categorized into various 'natural forces'.

### **Mechanism of inertial action:**

Speed of transmission of additional distortions in a macro body's matter-field depends on their magnitudes. In 3D spatial system, only inertial nature of efforts can transfer tangible work from one macro body to another. Inertial efforts may be transmitted at any speed but lesser than speed of light. Highest linear speed possible, is limited by ability of macro body's 3D matter-particles to maintain their integrity.

Effort (force) is recognized by its inertial action on 3D matter-bodies. Displacements of 3D matter-particles are necessary to create inertial actions. Inertial efforts are applied from outside a macro body. Additional distortions, produced by inertial efforts in a macro body's matter-field, are invested from external sources. Such investments may be carried out either by 'field efforts', gravitation or motion of external macro bodies towards it. Additional distortions (corresponding to an inertial action) may be created within a macro body's matter-field, by movements of its constituent 3D matter-particles or by direct transmission of additional distortions from matter-field of a 'force-applying body' into matter field of 'force-receiving body'. Inertial actions on constituent 3D matter-particles of a macro body, within its border, are restricted within its matter-field. They do not change state of motion of whole macro body. Hence, inertial actions confined within matter-field of a macro body do not subscribe towards inertial actions of whole-macro body. Internal efforts cannot modify state of motion of a macro body.

(Matter-fields of) two macro bodies are differentiated by additional distortions, associated with their individual matter-fields, within their borders. Taking a plane, passing through both macro bodies, it is same 2D energy-field passing through both macro bodies, in this plane. Nevertheless, parts of 2D energy-field, within borders of each, are distorted appropriately for state of motion of each of them and are parts of their separate matter-fields. Therefore, when it is said that a macro body is under action by another macro body, it means that additional distortions in matter-field of one macro body is brought to bear upon additional distortions in matter-field of another macro body. 3D matter-particles of macro bodies do not come in contact with each other, during collision between macro bodies. When a macro body is said to meet or collide with another macro body, it is their matter-fields, which meet or collide. In the process, both matter-fields (being part of same latticework-structure) try to modify each other by sharing total additional distortions. Collision between matter-fields, depending on strength of collision between two macro bodies, transfers part of additional distortions in them to each other. Since no transfer of matter-content takes place, macro bodies' matter-contents are not affected, (in usual cases).

Introduction of additional distortions from external sources vary magnitudes of distortions, already existing in matter-field of a macro body. Variation in magnitude of distortions changes stress at junction-points in latticework-structures of 2D energy-fields. Stress developed in arms of a latticework-square, transfer part of deformation to next latticework-square in front of it. Similar actions are repeated forward in the direction of external effort, in sequence. Because of latticework-structure of matter-field, no single latticework-square can be deformed or strained in isolation. Due to inter-linking of latticework-squares, strain in one of them is automatically transferred and shared by neighbouring latticework-squares in same plane.

Additional distortions, introduced by external effort, are progressively absorbed by latticework-squares of macro body's matter-field, allowing them to be strained and distorted. Latticework-square, nearest to point of application of external effort is distorted by highest magnitude, latticework-square next in front, is distorted to a lesser degree, latticework-square next in front, is distorted to still lesser degree and so on. Due to fluid property of universal medium, once the process of transfer of distortions start, it would continue indefinitely (similar to wave motion in ideal fluid), unless modified.

In fact, it is the distortions in latticework-structure, containing additional work, which are transmitted. Constituents of a latticework-square move only so much as required to store work of its share. Rest of work is transferred to next latticework-square and so on. During transmission of distortions, each latticework-square of 2D energy-field absorbs part of work by remaining in distorted condition to certain degree and passes on rest of distortion to subsequent latticework-squares. As and when whole of additional distortion, received by one latticework-square, is transferred to next one, each latticework-square returns to its original state. Additional distortions received by a matter-field, progress in the direction of external effort, while latticework-squares of 2D energy-field remain in place, in space.

### **Nature of inertial motion:**

When a macro body is moving under action of additional distortions in its matter-field, it is being displaced with respect to universal medium. Matter-field of macro body is moving. It is the additional distortions in latticework-structures, which are transferred. 3D matter-particles of macro body are carried

along with matter-field. 2D energy-fields are in constant existence throughout space. Therefore, wherever the macro body is in space, it has similar 2D energy-fields about it. Hence, it is impossible to determine relative motion between a macro body and universal medium.

We may determine a macro body's motion with respect to other macro bodies or other references in 3D spatial system, like a point in universal medium. Universal medium, in this concept, is the equivalent of 'aether' in 'aether theories' or 'fields' in 'field theories'. Constituent 3D matter-particles of macro body are moved with respect to latticework-structures of 2D energy-fields. Although 2D energy-fields are steady in space, it is the additional distortions in them, which are moving and carrying 3D matter-particles of macro body. Because of this arrangement, even though 3D matter-particles are moving with respect to static 2D energy-fields, no resistance is offered by universal medium to movements of macro body or its 3D matter-particles. It is like; a macro body has no displacement relative to universal medium, while it is moving through it.

A macro body, moving through universal medium, does not suffer drag or resistance from it. No 'aether drag' or 'aether wind' can be detected about a moving macro body, however large the compound-macro body may be or however fast its motion may be. Because, equivalent of 'aether' in this concept (universal medium), does not move itself but moves macro body by its actions. However, since distortions in universal medium are moving along with macro body's 3D matter-particles, effectively, there is no relative motion between macro body and universal medium.

Additional work, invested into matter-field of a macro body takes certain time (inertial delay) to stabilize itself and provide the macro body with a constant linear speed. This is true even after external effort is terminated. Additional work, introduced into matter-field and not yet stabilized before termination of the external effort, continues its stabilization in normal course of time. Ignoring this factor hinders our understanding of instantaneous direction of motion of a macro body, moving along a curved path. Currently, it is believed that instantaneous direction of motion of a macro body, moving in a circular path, is tangential at any location in circular path. In reality, instantaneous direction of motion of macro body, moving in circular path, is deflected outward from tangent to curved path [1]. Radial component of macro body's motion gives rise to imaginary external effort 'centrifugal force'. Fictitious efforts (like centrifugal force, currently called as inertial forces), invoked by imagination of observer to maintain validity of present theories and apparent forces, related to different frames of reference, are not considered as real efforts, in this concept. They serve for easier but irrational explanations and understanding of various phenomena.

Since additional distortions are transferred in 2D energy-fields and all 2D energy-fields exist in their own planes, a matter-field can be transferred only in straight-line. Each 2D energy-field, passing through macro body, transfers additional distortions in its own plane. Hence, all inertial motions are in straight lines (rotational motion is combinations of straight-line motions). Linear inertial motion of a macro body continues indefinitely in a straight line until macro body is affected by another external effort.

Once, certain magnitude of additional distortions are introduced into matter-field of a macro body, it remains permanently with it and continues keep macro body in its current state of motion indefinitely, until additional distortions are lost, modified or removed (neutralized by additional distortions in opposite direction) from matter-field by another external effort. Since additional distortions (introduced by external source) in matter-field are associated with 3D matter-particles, speed of their transfer is limited by magnitude of additional distortions. Hence, a macro body may move at any speed, lower than highest permitted speed by universal medium. As linear speed of a macro body increases to high value, constituent matter-particles of macro body break down to inferior matter-particles until macro body's speed reaches linear speed of light [1]. At linear speed of light, only photons from macro body can survive. Beyond this linear speed no 3D matter-particle can move. This limits speed of 3D matter-bodies in space to much less than linear speed of light. Gradually, even photons revert back to quanta of matter in universal medium.

Since 2D energy-field extends only in one plane, no distortion in its latticework-structure can be transmitted directly into third spatial dimension. Transmission of distortion is restricted to the plane of

corresponding 2D energy-field. A 3D matter-particle simultaneously occupies gaps in many 2D energy-fields (3D space) in same location. Distortions in all these 2D energy-fields, act on 3D matter-particle, in their respective planes to move it. 3D matter-particle, being three-dimensional, produces additional distortions, during its motion, in all 2D energy-fields occupied by it. In this way, distortions in one 2D energy-field may be transferred or transmitted to other 2D energy-fields, indirectly. Effort, (presumably) acting through universal medium on a 3D matter-particle, has its components in one or more 2D energy-fields in all planes occupied by it. Actions by various 2D energy-fields, together, produce straight-line transmission of distortions in 3D spatial system.

### **Range of inertial action:**

Consider a small hypothetical direct (point) effort, applied to a junction-point of latticework-square in matter-field of a macro body. To do work, there has to be a movement. Assuming the point of application has moved by a small distance, along with other quanta of matter attached to junction point, the effort can be regarded to have acted on macro body. Certain additional work is done in its matter-field by making a change in it, namely, movements of certain quanta of matter in relation to others.

Movements, produced in matter-field, are that: first latticework-square in line of external effort is deformed to a maximum (corresponding to strength of effort), next latticework-square to a lesser degree and next latticework-square to a still lesser degree and so on, up to the range of effort. This process continues until a latticework-square at certain distance from point of application of effort does not receive deformation at all. Each latticework-square preserves certain amount of additional distortion in it and passes on the rest. After, whole of additional distortions are absorbed by latticework-squares, subsequent latticework-squares do not feel action of effort at all. This limits range of direct inertial effort. It is limited within matter-fields (of macro bodies) in direct contact. Action at a distance through empty space is an impossible proposition for two reasons. One is that there is no empty space. Second is that range of inertial action is limited to within matter fields of macro bodies, which are in direct contact.

If action of an external effort continues or its magnitude is increased, magnitude of strain in latticework-squares of matter-field and corresponding stress in them increase and few more latticework-squares of matter-field, in the direction of external effort, are deformed. Range of an inertial action corresponds to magnitude of additional distortions, it may invest into matter-field of a macro body. On termination of external effort, no further action is present, but distortions already invested in matter-field continue to move macro body at constant linear velocity.

Additional deformations of latticework-squares, produced by external effort, may be regarded as temporary work done on macro body. They remain with latticework-squares until they are transferred to their neighbors. This is all the effect, a direct external effort can cause to a macro body / its matter-field. Consequences, due to this effect, like motion of macro body, etc. are the result of reactions from matter-fields to additional distortions, introduced into them.

### **Conclusion:**

Inertia is a property of universal medium due to its latticework-structures. Certain delay is required during action of effort (force) for stabilization of distortions in universal medium. Once, a macro body attains its stable linear speed in space, it continuous to maintain its constant state of motion. These two phenomena, together, create observable fact that a macro body is reluctant to change its state of motion. Although effects are observed on macro bodies, they are caused by reluctant action of universal medium. Hence, inertia is a property of universal medium rather than that of matter. Inherent character of universal medium to strive towards absolute homogeneity is the cause of all actions and inertia.

### **Reference:**

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

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