

# INERTIA

(According to “Hypothesis on MATTER”)

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*Abstract:* Inertia causes all macro bodies to respond sluggishly to external efforts. Three-dimensional matter bodies are inert and they have no ability to move, act or oppose external efforts. However, since no other entity that can prevent instantaneous effects on a 3D matter body by an external effort or maintain constant state of motion of a macro body is known, the phenomenon of inertia is attributed to matter itself, in negative sense. Phenomenon of inertia rightly belongs to the universal medium, which encompasses all 3D matter bodies in entire universe. Inertia is the property of universal medium due to its latticework structure. Only when the mechanism of action of external effort and mechanism of motion of 3D matter bodies are understood, nature of inertia will be clear. All actions in nature are understood by inertial motions/deformations of 3D macro bodies. They have definite mechanism. Motion/deformation of a macro body is the result of additional work-done in the universal medium about the macro body. Mechanism of inertial motion consists of simple rearrangement of constituent ‘quanta of matter’ in the universal medium, about a macro body, to create travelling distortions in the universal medium. Force is the rate of additional work-done about a body with respect to body’s acceleration. Forces being mathematical concepts (rates of work), all natural forces are similar. Classifying natural forces, according to their manifestations, does not make any difference in their mechanism of actions or nature of results.

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

## Introduction:

‘Hypothesis on MATTER’ advances a revolutionary new concept, which explains all physical phenomena based on just one type of (postulated) basic matter particle – the Quantum of matter. Quanta of matter form latticework structures called ‘2D Energy Fields’. 2D energy fields, formed each plane has independent existence. A 2D energy field extends infinitely in all directions in its spatial plane. It can act or be acted upon only in its plane. All possible spatial planes have one 2D energy field, each, to fill the entire space. Together, they create an all-encompassing universal medium with definite structure and properties. Since the structured 2D energy fields fill entire space, it can replace formless space or undefined fields,

currently used. 2D energy fields are self sustaining real matter bodies, which are reasonably isotropic, homogeneous, serene, stable and steady in space. 2D energy fields, together, provide a static and absolute reference to all actions in space. They are inherently under compression. Any distortion in 2D energy fields produces reaction, which tends to restore their stability. An action creates or introduces distortions in the latticework structure of 2D energy fields. Due to inherent stability of 2D energy fields, a distortion in its structure tends to be transferred in the direction of action. All real 3D matter bodies exist within 2D energy fields. 2D energy fields are in direct contact with every 3D matter particle in nature. A 3D matter particle, which happens to be in the region of 2D energy field-distortions that are being transferred, will be carried along with the distortions.

Adjective ‘inertial’ is currently used to indicate fictitious or imaginary nature. ‘Inertial force’ is a fictitious force used in mechanics to validate certain theories. They are not real. Therefore, inertial forces are functional entities, which fulfill functions assigned to them. In this concept, an entity that invokes the property of inertia is qualified as ‘inertial’. An inertial effort is that effort, which invokes the property of inertia, associated with motion/deformation of matter bodies. Since, invoking the property of inertia is an action, inertial efforts are real entities. Deformation or rotary motion of a macro body essentially involves linear motions of its parts. Hence, we shall discuss only linear inertial motions of 3D macro bodies, in this article and shall not mention their deformation or rotary motion, separately. Motion of constituent 3D matter particles of a macro body causes macro body’s motion. All matter bodies, formed by association of more than one ‘basic 3D matter particles’ is regarded as macro bodies. Figures are not drawn to scale. They are depicted to emphasise phenomena represented. All conclusions, expressed in this article, are taken from “*Hypothesis on MATTER*” [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 if the Earth is really spinning on its axis and orbiting (*about*) the Sun, we do not sense those motions. Since we are in motion together with the Earth, and our natural tendency is to retain that motion, the Earth appears to us to be 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 the same state of motion seen by different observers; one moving at the same velocity as the moving body, the other moving at constant velocity with respect to the moving body. [We should also note that no matter 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 matter bodies. Hence, this behavior was simply assumed to be a property of the most obvious entity that could be observed – the matter.

Inertia is an observed tendency of matter bodies. It need not be a property of matter. Matter bodies appear not to respond instantaneously to the 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 a delay in the action of an effort on a matter body is observed, the property of inertia is attributed to matter body (which is under the action) without any logical basis. While considering motion in a circular path, the pseudo centrifugal force is often thought as caused by inertia of the moving body. In some other cases, it is proposed that gravity and inertia are always working simultaneously against each other, and in proportion to an 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 the ‘*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 but it is only an attributed property of matter; because matter cannot act or move by itself. 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 3D matter body cannot be the cause of its own motion or the inertia associated with it. 3D matter bodies need an agency to act on them or to produce apparent interactions between them. This agency is external to the 3D matter bodies and acts as an intermediary agency between the apparently interacting 3D matter bodies. In fact, the intermediary

agency acts on each of the 3D matter bodies separately and the result of simultaneous actions on different 3D matter bodies, when considered together, appear as interaction between the 3D matter bodies.

### **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/property it has not. A quality or attribute is a functional character, any 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 the above given 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. We have seen that an external agency is required to move a 3D matter body. If this external agency has ability to move 3D matter bodies, property to cause delayed action is one of this external agency's qualities. A property of a 3D matter body, expressed in negative sense, can mean a property of the external agency, expressed in positive sense. Thus, inertia can mean the property of external agency to cause delay in motion or change the rate of motion of a 3D matter body.

Inertia is a passive property. It can only oppose efforts (forces or torques) by active agents. A moving 3D matter body moves at a constant linear speed not because of its inertia but only because of the absence of an effort by an external agency to slow it down, change its course, or speed it up. Inertia appears or is present only during a change in body's state of motion. Inertia does not act on a body in any manner. Cause of motion does not affect development or magnitude of inertial measurements. Whichever, natural phenomena or effort (natural force) cause a 3D matter body's motion, development and magnitude of measurements, related to inertia, will be same.

In physics, quantitative measure of inertia is considered as a fundamental property of all matter. It is so, by virtue of which a matter body opposes any agency that attempts to put it in motion or, if the matter body is already moving, to change the magnitude or direction of its linear or rotational velocity. Inertia is a passive property that does not enable a body to do anything except oppose such external active agents. Inertia is the 'resistance' that a matter body appears to offer to a change in its speed or position upon the application of an effort (force). Even though, the matter body does not or cannot do anything to offer or change this resistance, this behavior — observed with respect to its motion — is attributed to the 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 a matter body, the word 'resistance' acquires special significance. Resistance is developed during relative motion between (at least) two entities in contact. This implies that a matter body, during its change of state of motion, has a relative motion with respect to another entity, which is in direct contact with the moving body. And during its constant state of motion, the matter body experience no inertia. This implies that during constant state of motion of a matter body, there is no relative motion between matter body and the external agency.

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

In the past, many intermediary agencies or media like, different types of aethers, diverse fields, etc. were proposed by number of scientists. Being very vague, none of them stood scrutiny for long time. Although each of them had characteristic properties to mathematically suit corresponding theories, for which it was proposed, none of them had rational constituents or logical structure. Although, the existence of an 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 logical (?) 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, the mechanism of action continues to remain a mystery. Therefore, we were compelled to assign the property inertia, which

rightly belongs to the unobservable (and undefined) external agency, to observable matter bodies in negative sense.

The concept, in ‘Hypothesis on MATTER’, proposes a universal medium that fulfils all requirements, needed in various theories. It has only one type of (postulated) real matter particles as its constituents — the quanta of matter. Inherent properties of ‘quanta of matter’ helps them to logically structure themselves into a universal medium that fills the entire universe, outside 3D matter particles. This universal medium, called 2D energy fields, together with 3D matter particles in it, behaves like a single body of highest matter density. 2D energy fields have real matter particles as their constituents and definite structure. All actions on or by 3D matter bodies and apparent interactions between them are the results of inherent property of 2D energy fields to attain homogeneity and serenity. Acceptance of a universal medium can remove all mysteries, present in physical science today.

Distortions in 2D energy fields, associated with a matter body, are the work associated with the matter body. Changes in the work associated with a matter body changes its state of motion. Distorted region in the 2D energy fields, in and about a macro body, is the macro body’s ‘matter field’.

Inertial delay is caused by the time delay, required for stabilization of distortions in the 2D energy fields during variation in magnitude of additional work associated with a matter body. Additional work-done about a matter body is the magnitude of ‘additional distortions’ in the universal medium around a macro body (its constituent 3D matter particles).

Gravitational attraction is caused by the difference between the extents of 2D energy fields in between and on the outer sides of two matter bodies.

Outward displacement of a body, moving in circular path, away from the centre of circular path due to outward deflection of direction of inertial motion of a body from the tangent to the circular path is assumed as the displacement caused by centrifugal force.

All these three phenomena are related to actions of 2D energy fields. Hence, they may sometimes overlap or appear simultaneously about a macro body.

### **Measurement of inertia:**

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

Inertia of a matter body, in relation to its linear motion, is the body’s ‘mass’. A matter body’s ‘mass’ governs the body’s resistance to the action of an external effort (force); acting in a direction through centre of the body’s matter content. Since magnitude of this resistance is proportional to magnitude of the body’s matter content, mass of a body is generally understood to represent magnitude of the body’s matter content. Note that mass and force are defined on mutual basis – by circular logic.

A matter body’s ‘moment of inertia’ or ‘rotational inertia’ about a specified axis measures the body’s resistance to the action of an external effort (torque) about the same axis. This axis could be through within or without the rotating body. Greater the mass or moment of inertia of a body, smaller is the change produced by an action (by applied effort). Moment of inertia of a macro body about an axis is the sum of moments of all its matter particles about the specified axis. Magnitude of moment of inertia depends not only on the matter content of a macro body but also on parameters of axis chosen. For the same macro body, depending on the axis chosen, different magnitudes of resistance may be exhibited.

Inertia is a property of 2D energy fields, produced due to their latticework structures. Apparent attraction due to gravitation is the product of difference in the extent of 2D energy fields on opposite sides of a matter body. Both these phenomena have nothing to do with mass of a body, which is the mathematical relation between an external effort (force) on a macro body and its acceleration. Therefore, differentiation of inertial measurements into ‘gravitational mass’ and ‘inertial mass’ are arbitrary.

In mechanics, we generally use relative reference frames to describe all actions. In this, we assume a reference body as the static reference in space and relate motions and locations of all other bodies with the

chosen reference. A displacement of reference point/body (or an action on it) is automatically assigned to referred-bodies (in opposite direction) instead of to the reference-body. By assuming the reference-body to be stationary and taking relative motions of referred-bodies as true facts, we greatly alter parameters of these bodies and their movements. Use of these altered parameters to determine physical actions by/on bodies, resulting parameters of bodies or shape of their paths will be incorrect.

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

## **Motion:**

Motion is the process of displacing a matter body from one location to another location in space. A 3D matter body cannot simultaneously exist in two places. There has to be an interval between the matter body's appearance in one location and its subsequent appearance in another place. This interval gives rise to a functional entity, called time. Locations, where the matter body is located before and after its motion, are situated in space. In order to distinguish these positions from each other, it is essential that they be separated by a distance. If the separation between present and past locations is related to any of the locations, resulting displacement of the matter body denotes its 'absolute motion', in space. If the separation between present and past locations is related to any other reference matter body, resulting displacement of the matter body denotes its 'relative motion'.

Motion of a body is with respect to an external reference. Motion of a part of a matter body, during its deformation, is with respect to a reference outside the deformed part of the body. State of a body is determined by additional work (more than those required to maintain the integrity and state of motion of a macro body and its constituent 3D matter particles) associated with it, with respect to the same reference. Time interval, required for the distribution and stabilization of additional distortions (work) in the matter field, is the inertial delay. Inertial delay is the time interval between the instant of commencement (or cessation) of action by an external effort on a matter body and the instant at which all 3D matter particles of the matter body have completed their response to the action of the effort, at which the body has attained a steady state of its motion, corresponding to the action.

Due to the inertial delay, it takes certain time interval after commencement of an action of an effort on a macro body, to stabilize macro body's speed and reach a steady state. Similarly, it takes certain time interval for the macro body, after termination of action of an external effort on it to stabilize its speed and reach a steady state of motion. Unfortunately, the second part mentioned, is usually ignored. Inertial delay depends on the size of the macro body (in terms of its matter content) in the direction of external effort and its matter density. Larger macro bodies and macro bodies of lower matter density take longer to reach steady state (of motion). After stabilization of a macro body's state of motion, additional distortions in macro body's matter field continue to be transferred through the 2D energy fields at a steady speed. Transfer of distortions in 2D energy fields moves the 3D matter particles of the macro body, in them. Resultant distortions, in 2D energy fields, travel in straight lines in their own planes. Hence, the paths of inertial motions of all matter bodies in space are inherently in straight lines. Rotational motion of a macro body is the combination of straight-line motions of its numerous constituent matter particles in as many directions.

## **Relative motion:**

Relative motion of a matter body indicates its displacement with respect to another matter body. These are not the body's real displacement corresponding to additional work (energy) associated with the body. Depending upon the parameters of the reference body, magnitudes and directions of these relative motions vary. Magnitude and direction of relative motion depends on not only the magnitude and direction of matter body's displacement but also on the magnitude and direction of reference body's displacement, in

same interval of time. Hence, magnitude and direction of motion given by relative motion are apparent parameters. They can at the most suggest correct relative position of a matter body in relation to the reference body. Relative motion cannot describe correct parameters of the moving matter body or its correct path in space. Since, parameters of these motions are not true, no physical laws should be based on them.

An example: Central body of a planetary system is a moving body. We get circular/elliptical shapes of planetary orbital paths, only when the central body is assumed as a static body. These structures are unreal and they can be used only to determine relative positions of planets with the central body. Movement, path of displacement, rotation, precession, etc. are physical actions and they are restricted to physical (real) bodies. Apparent orbit of a planet (orbital path with respect to a static central body), being only an imaginary structure, it cannot move, rotate or precess. As long as the central body is moving, no planetary body can orbit around it in a geometrically closed real path. No free body (other than galaxies) can remain stationary in space. [Galaxies have special mechanism that keeps them in space without translational motion. See article on ‘Galactic repulsion’]. Real orbital path of a planetary body is of wavy shape about its moving central body. A planetary body and central body move along a median path around (static) galactic centre, planetary body moving periodically to front and rear of the central body. Hence, other than for determination of their relative positions, assumption of circular / elliptical orbits is useless.

### **Absolute motion:**

No 3D matter body can exist without motion. In fact, basic 3D matter particles are sustained due to their steady motion. Matter is inert. It can only provide a platform for actions, i.e. matter body can be moved linearly or angularly at different accelerations or speeds in different directions. It is the universal medium that moves 3D matter particles through itself. 2D energy fields are in direct contact with every basic 3D matter particles (of macro bodies). Transfer of distortions in 2D energy fields carries basic 3D matter particles along with them. Combined displacements of all its constituent 3D matter particles displace a macro body.

Universal medium, provided by the 2D energy fields, is reasonably steady in space. Therefore, the 2D energy fields or any point in them can provide an absolute (steady) reference in nature. Motion with reference to an absolute reference is absolute motion. Only absolute motion can show real parameters of a moving body and shape of its path. To obtain relative positions of two macro bodies, it is necessary to consider absolute motions of both macro bodies. For practical purposes, this may be slightly more complicated than using relative reference frame, with either of the macro bodies as a static reference.

In nature all matter bodies are under continuous motion and 2D energy fields are hidden from our view. Hence, it is very difficult to ascertain an absolute reference. It may be realised from inertial actions on matter bodies or derived by other means. All real actions and their results on parameters of matter bodies depend on magnitude of absolute motion. Development of a matter body and sustenance of its integrity require certain magnitude of associated work. This is the intrinsic work (energy) associated with the matter body. Additional work (energy) associated with a matter body determines its state of motion. Magnitude and direction of absolute motion is in relation with the universal medium. True parameters and shape of body’s path depends on the body’s absolute motion.

### **Inertial motion:**

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

Causes and mechanisms of motions of matter bodies have logical explanations. ‘2D energy fields’ (the universal medium) is the moving-agency of a matter body and the mechanism of motion is entirely a part of 2D energy fields’ inherent property to strive towards absolute homogeneity. A deformation or transfer

of distortions in the 2D energy fields is bound to displace a 3D matter particle, floating in it. As the mechanism of motion is fully contained in the 2D energy fields, inertia becomes a property of this external agency. Once, inertia is considered as a property of the 2D energy fields, mass of a body becomes the measure of ability of the 2D energy fields to cause motion or change of rate of motion of a matter body. Since the measure of this ability (in case of linear motion) is related to the matter content of a body, it can be considered to represent amount of (material) matter contained in a matter body, under static conditions.

It is an inherent property (derived from the characteristic properties of its constituents) of 2D energy fields to strive towards homogeneity and serenity. Hence, no distortion in 2D energy fields can remain localised. They tend to either spread out within the 2D energy fields or travel through 2D energy fields in the linear direction of their introduction. During creation of basic 3D matter particles (from disturbance in the 2D energy fields [1]), 2D energy fields around the 3D matter particle are distorted by gravitational actions. Shape of the basic 3D matter particle, created by gravitational actions, cause differences in the distortion-density in the 2D energy fields, on different sides of the basic 3D matter particle. 2D energy fields tend to equalise the distortion-densities by transferring distortions from high distortion-density region to lower distortion-density region. During the transfer of distortions, 3D matter particle in the region is also moved along with the distortions. This type of actions in the 2D energy field causes basic 3D matter particles to move linearly at the highest possible speed. This is the speed of light. The basic 3D matter particle, created by gravitational actions of 2D energy fields, and the associated distortions around the matter core of the basic 3D matter particle, together, form a corpuscle of light – a photon [1] [2].

Basic 3D matter particles (photons) are moved by the 2D energy fields, at the highest possible linear speed. This linear speed is limited by the ability of 2D energy fields to move its constituent quanta of matter, without their own structural breakdown. Since it is the 2D energy fields, which cause and limit the speed of light, critical speed of light depends on the nature of 2D energy fields in any region of space. Hence, the constancy of speed of light is not a universal phenomenon. Photons, being the basic 3D matter particles, form all other superior 3D matter bodies found in nature. While they are part of superior 3D bodies, photons are confined to move in circular paths, within the corresponding primary/fundamental matter particles. Critical linear speeds of photons are maintained in their curved paths even when they are part of fundamental particles/macro bodies. When the photons constitute fundamental particles/macro bodies, their paths are curved and confined within primary matter particles they form.

Within a primary matter particle, 2D energy fields (by gravitational actions) move photons at constant linear speed along their common curved path. Depending on the distortion-density on either side of curved path of its linear motion, a photon may also be simultaneously moved sideways by transfer of distortions. Actions of ‘field forces’ cause macro body’s motion by displacing constituent photons of primary particles sideways, in their curved paths and without affecting their critical linear speeds. Sideways displacements of constituent superior matter particles move whole of the macro body. This is the mechanism of motion under field forces (produced by the interaction between electric, magnetic and nuclear fields). Sideways motion of constituent photons causes fundamental particles/macro bodies to displace themselves towards the region of lower distortion-density in the 2D energy fields. This phenomenon causes apparent attraction or apparent repulsion between different 3D matter bodies. Since we do not appreciate the presence of 2D energy fields, 3D matter bodies appear to move towards (attract) or move away from (repel) each other, under actions of field forces.

Sideways displacements of photons, along with the superior matter particles/macro body, they make, are bound to produce distortions in the surrounding 2D energy fields, which correspond to the displacement of macro body. These distortions, once produced, tend to be transferred in a straight line, indefinitely at constant velocity through the 2D energy fields. As these distortions are being transferred they carry all constituent 3D matter particles of the macro body along with them. This process of motion will continue until the 2D energy field-distortions surrounding the macro body are removed or varied in magnitude by another set of distortions in the 2D energy fields.

If the action of an external effort in any way affect photons’ linear speed along with their curved paths (instead of causing sideway displacement or along with sideway displacement), it may cause the photons to gain or lose matter (and energy) contents. If the action tries to slow down the photons, the photons tend to lose their matter (and energy) content and lower their frequency. This process is heating. Matter/energy contents, lost from photons may form new photons to be radiated from hot body. If the action tries to speed

up the photons, the photons tend to gain matter (and energy) content from surrounding 2D energy fields and raise their frequency. This process is cooling. Currently, these actions are not considered as inertial actions.

Development of distortions in 2D energy fields necessitates displacements of constituent quanta of matter of the 2D energy fields. Displacements of any matter body are work-done. Hence, development of distortions in 2D energy fields is work. Rate of this work, being developed in the 2D energy fields about a 3D matter body (with respect to distance moved) is the 'force'. 'Force' is a mathematical relation between linear acceleration of a matter body and the matter body's mass. Hence, it is a functional entity. Distortions in 2D energy fields strain their inherently stable structures to produce stress in them. Stress in 2D energy fields is the 'energy' associated with the work (distortions). Since energy is proportional to the 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.

Displacements of constituent quanta of matter of 2D energy fields and production of distortions in them (about a macro body) take time to accomplish. Hence, a work is done slowly and progressively by an effort. No inertial effort can act instantaneously. Additional work-done in a macro body's matter field needs some time to rearrange and stabilise structural deformation in 2D energy fields about the macro body. During this time, the 3D macro body is under acceleration/deceleration stage. By the time, additional work about the 3D macro body (in the 2D energy fields) is stabilized; 3D macro body's acceleration/deceleration period is over. [The fact that the requirement of acceleration/deceleration period is essential for the additional work to be stabilised, irrespective of the continued action of external effort, is often overlooked]. Thereafter, the 3D macro body will be carried at a constant linear velocity by the distortions, being transferred through the 2D energy fields.

Additional distortions in the 2D energy fields, required to move a macro body, can also be supplied by inertial action of another macro body. Let us consider a moving macro body 'A' making contact with a static (or slower moving) macro body 'B' in the same direction. Presence of macro body 'B' restricts free motion of macro body 'A', as dictated by moving-additional distortions in the 2D energy fields, associated with that macro body. However, matter particles of macro body 'B' cannot restrict additional 2D energy field-distortions in the region of macro body 'A', from encroaching into its own space. Part or full of additional 2D energy fields-distortions, associated with macro body 'A', advance into the space occupied by macro body 'B'. As the additional distortions continue to be transferred through the space occupied by macro body 'B', its 3D matter particles will also be carried along with the moving-additional distortions. Motion of macro body 'A' is now transferred to macro body 'B', partially or in full. If whole of additional distortions in 2D energy fields associated with macro body 'A' is transferred into space occupied by the macro body 'B', macro body 'B' will start moving at a speed corresponding to the additional work (energy), it received from macro body 'A' and macro body 'A' will come to a stand still. If the transfer of additional distortions is partial, both macro bodies will continue to move at speeds corresponding to additional work (energy) associated with them. Additional work (energy) lost by macro body 'A' will be equal to additional work (energy) gained by macro body 'B'.

For the transfer of inertial motion from one macro body to another, it is essential that the 'force-receiving body' be moving at a slower linear speed compared to the 'force-applying body'. If 'force-receiving body' is already moving at the highest possible linear speed through the universal medium, no additional 2D energy field-distortions, in the direction of its motion, can be transferred into the matter field of the 'force-receiving body'. This is because the speed of 2D energy field-distortions cannot exceed the highest linear speed, permitted in 2D energy fields. In such cases, mass of the 'force-receiving body' will reach infinite proportions. This requirement of lower linear speed of 'force-receiving body' restricts the efficiency of applied effort on a macro body, in the direction of its linear motion and causes the 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 2D energy fields cause these structures to compress in the direction of motion of the macro body, by certain magnitude, proportional to magnitude of macro body's linear speed. As this compression is in linear direction, it helps the latticework structure of the macro body's matter field to reduce in length (in the direction of the body's motion) and expand in perpendicular directions of its linear motion. The macro body as a whole will contract 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 linear speed of the macro body.

Should the direction of transfer of additional distortions (action of field forces) and the direction of motion of a moving macro body are not co-linear, transfer of additional distortions can affect the moving macro body only as long as the macro body is in the path of the moving additional distortions. Thus, planetary bodies moving in orbital paths about a central body experiences higher central force towards their rear ends compared to their forward ends. Centre of gravity of a free orbiting body shifts to the rear from its centre of 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. Displacements of macro bodies, which give rise to the phenomenon of inertia, are inertial motions. Inertial motions are due to additional work-done about a macro body. Additional work, done about a macro body, is equal to the magnitude of force multiplied by the magnitude of distance moved by the body during action of an external effort (macro body's accelerating/decelerating stage). Force, being a (mathematical) relation between rest mass of a body and rate of change of its speed (due to the 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 the 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:**

Only brief explanation on the mechanism of linear motion is given here. Deformation of matter bodies, which is the result of inertial motions of parts of the matter body, is also an inertial action. Details on mechanisms of linear and rotary motions, combined linear and rotary motions, relativistic mass, linear contractions of moving bodies, etc. may be found in reference book [1].

Speed of transmission (within a macro body) of the additional distortions depends on the magnitude of additional distortions invested into the matter field of a macro body. In 3D spatial system, only the inertial nature of efforts can transfer tangible work from one macro body to another. Inertial efforts may be transmitted at any speed but at lesser than the speed of light. Highest speed possible, is limited by the ability of macro body's matter particles to maintain their integrity and by avoiding local breakdown of 2D energy field-latticework structure. Action of an inertial effort transfers additional distortions from the matter field of 'force-applying body' to the matter field of 'force-receiving body'. As there can never be a point-direct effort (because matter field of any body is extremely large compared to a latticework square of a 2D energy field), explanation in the following section is only a hypothetical case where a point effort is considered to bear upon one or few of the latticework squares of a matter field.

In 3D spatial system, an effort (force) is recognized only by its inertial action on matter bodies. Displacements of 3D matter particles are necessary to create inertial actions. Inertial efforts are applied from outside a 3D macro body. Additional 2D energy field-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 forces', by gravitation or by the motion of external macro bodies towards it. Additional 2D energy field-distortions (corresponding to an inertial action) may be created within a macro body's matter field, by movements of macro body's constituent 3D matter particles or by direct transmission of additional distortions from matter field of a 'force-applying body' into the matter field of a 'force-receiving body'. Inertial actions on constituent 3D matter particles of a macro body, within its body-limits, are restricted within the macro body's matter field. They do not change state of motion of the whole macro body. Hence, any inertial actions confined within the matter field of a macro body do not subscribe towards inertial actions of the whole-macro body.

Matter fields of two macro bodies are differentiated by additional distortions, associated with their individual matter fields, within their body-dimensions. Taking a plane, passing through both the macro bodies, it is the same 2D energy field passing through both the macro bodies, in this plane. Nevertheless, parts of this 2D energy field, within the confines of borders of each macro body, are distorted appropriately for each of the macro bodies and are parts of their matter fields. Therefore, when it is said that a body is

under the action of an effort by another body, it means that the additional distortions in the matter field of one macro body is brought to bear up on the additional distortions in the matter field of another macro body. 3D matter particles of the macro bodies do not come in contact with each other, during a collision. In the process, both the matter fields try (they being part of the same latticework structures, tend to share total additional distortions by influencing each other) to modify each other. When a macro body is said to meet or collide with another macro body, it is their matter fields, which meet or collide. Matter field represents distortions in the 2D energy fields within a macro body's dimensional limits. Collision between the matter fields, depending on the strength of collision between two macro bodies, transfer part of additional distortions in their matter fields to each other. Since no transfer of matter content takes place, macro bodies' matter contents are not affected, in usual cases.

Before transfer of additional distortions from the matter field of 'force-applying body' to the matter field of 'force-receiving body', each matter field-latticework square of 'force-receiving body' is deformed to the extent that is required for the stable existence of the macro body. Introduction of additional distortions from external sources correspondingly vary magnitudes of distortions, already existing in the matter field. Stress developed in the arms of a 2D energy field-latticework square, transfers part of the deformation to the next latticework square in front of it. Similar actions are repeated forward in the direction of external effort, in sequence. Because of the latticework structure of matter field, no single latticework square can be deformed or strained in isolation. Due to the inter-linking of the squares in the latticework, strain in a latticework square is automatically transferred and shared by the neighbouring latticework squares in the same plane.

Additional distortions, introduced by an external effort, acting on any part of the 2D energy field, are progressively absorbed by the latticework squares of the matter field, allowing them to be strained and distorted. Latticework square, nearest to the point of application of the external effort is distorted by highest magnitude, the latticework next in front, is distorted to a lesser degree, latticework square next in front, is distorted to still lesser degree and so on. This is how additional distortions, introduced by an external effort (applied to a part of the 2D energy field) is transmitted through matter field of a macro body. In fact, it is the distortions in the 2D energy field, containing the additional work, which are transmitted. A latticework square move only so much as required to store the work of its share. Rest of the work is transferred to the next latticework square and so on. During transmission of distortions, each latticework square of the 2D energy field absorbs part of the work-done by remaining in distorted condition to certain degree and passes on the rest of distortion to the subsequent latticework squares. As the additional distortions, received by a matter field, progress in the direction of external effort, 2D energy field-latticework squares remain in place in space.

We shall consider action of a linear inertial effort on a 'force-receiving body' by a 'force-applying body'. During this action, two types of inertial actions are bound to take place. In one type of action, matter field about 3D matter particles of both the 'force-applying' and 'force-receiving' macro bodies are compressed on their impact, against inherent stabilising tendency of 2D energy fields. Subsequent decompression of both matter fields causes certain acceleration/deceleration of 3D matter particles of both macro bodies due to reinstatement to their stable positions. As a 'force-applying body' approaches a 'force-receiving body', 2D energy field-distortions about the nearest 3D matter particles in both macro bodies come within their interacting-distance. 3D matter particles of macro bodies tend to keep their relative distance between them. In the process, 3D matter particles of 'force-applying body' are moving towards 3D matter particles of 'force-receiving body', which are reluctant to move away, due to inertia. Distances between 3D matter particles in both macro bodies reduce. In doing so, matter field between each 3D matter particle to its neighbour (in the direction of effort) is compressed. Compressed matter field-latticework, by its inherent properties, tends to regain its natural state by expanding outwards. This action will continue as long as the 'force-applying body' has a relative displacement towards the 'force-receiving body'. Meanwhile, expansions of the matter fields, after their initial compression, produce inertial actions on 3D matter particles of both the macro bodies. Movements of 3D matter particles of both macro bodies create additional distortions in their matter fields. These additional distortions accelerate/decelerate 3D matter particles of macro bodies, within corresponding matter fields.

Assume a macro body, with its matter field that can absorb additional distortions introduced by an external effort applied on it without a reaction, other than deformation of few of its latticework squares. The matter field stores no permanent distortions in it. Let the 'force-applying mechanism' become free,

after the action of the effort into the matter field and ceases to apply further effort. As soon as the matter field (macro body) is freed of action from the ‘force-applying mechanism’, deformed matter field-latticework squares commence return to their original shape and place. In doing so, they shall apply a reaction onto the ‘force-applying mechanism’, which applied the effort that resulted in the additional distortions. Latticework squares in the matter field of the ‘force-receiving body’, while returning to their original shape and place will push back the ‘force-applying mechanism’. This reaction, applied by the matter field on to the ‘force-applying mechanism’, is equal but opposite in direction to the original action of effort. Thus, the (temporary) work-done in the matter field of ‘force-receiving body’ is released and it (effort used for that work) is now returned, to the ‘force-applying mechanism’. The ‘force-applying mechanism’ will return to its original state. If the ‘force-applying mechanism’ is absent, the distortions, corresponding to the (temporary) work, are transferred out of the ‘force-receiving’ macro body’s matter field, into space. This phenomenon is a ‘fully elastic collision’.

Although, there are no rigid bodies in this concept, for the time being, we may assume both the ‘force-applying’ and ‘force-receiving’ macro bodies are rigid bodies of similar parameters. This will make the explanation simpler to understand. Inertial actions between colliding rigid macro bodies take place during the time, when the ‘force-receiving body’ and the ‘force-applying body’ are in contact. Part (or full) of additional distortions in the matter field of ‘force-applying body’ is transferred into matter field of ‘force-receiving body’ through space (2D energy fields). This is an inertial action, which changes states of whole-body motion of both the ‘force-applying’ and ‘force-receiving’ macro bodies.

We shall consider an impact between two rigid macro bodies, where after the impact, the ‘force-applying body’ comes to a stop and the ‘force-receiving body’ moves with appropriate velocity. Due to its motion at higher relative velocity, the ‘force-applying body’ has higher additional distortion-density. Due to assumed rigidity of the macro bodies, the macro bodies or their matter fields are not compressed during impact between them. Since the ‘force-receiving body’ can be moved only after inertial action, ‘force-applying body’ is stopped on its path by the ‘force-receiving body’. Although matter-part of ‘force-applying body’ is stopped in its path, additional distortions in its matter field continue to be transferred through 2D energy field at its original (constant) linear speed. Whole of additional distortions in the matter field of ‘force-applying body’ moves forward and away from matter-part of the ‘force-applying body’. Matter particles of ‘force-applying body’ are left without momentum. Additional distortions, which left the matter field of ‘force-applying body’, move forward through 2D energy fields into the space occupied by matter field of ‘force-receiving body’.

As and when these additional distortions reach the ‘force-receiving body’, its matter field is modified with additional distortions, received during the action. 3D matter particles of the ‘force-receiving body’ develop motion corresponding to additional distortions, received by the body’s matter field, in addition to their original motion. Whole momentum of ‘force-applying body’ stands transferred to ‘force-receiving body’. After stabilization period, ‘force-receiving body’ attains a constant linear motion corresponding to total additional distortions, its matter field has. If the parameters of ‘force-applying’ and ‘force-receiving’ bodies are identical and the ‘force-receiving body’ is in static condition (with respect to ‘force-applying body’), the ‘force-applying body’ will come to a halt and ‘force-receiving body’ will move at the same constant linear speed as the original linear speed of ‘force-applying body’. Differences in parameters of ‘force-applying’ and ‘force-receiving’ bodies will correspond to changes in magnitudes of momentum transferred between the bodies. Transfer of additional distortions between ‘force-applying’ and ‘force-receiving’ bodies will continue only as long as the macro bodies are in contact and linear speed of ‘force-applying body’ exceeds linear speed of ‘force-receiving body’, in the same direction. As and when linear speed of ‘force-receiving body’ equals or exceeds that of ‘force-applying body’, interactions between their matter fields will terminate.

If the effort from ‘force-applying body’ is able to act on ‘force-receiving body’, both their matter fields are simultaneously modified. Normally, we consider only the modifications in the matter field of the ‘force-receiving body’, unless we are taking the reaction also into consideration. In case, the ‘force-receiving body’ produces certain changes in additional distortions in the matter field of ‘force-applying body’, due to their relative speed, the ‘force-applying body’ will start to move in the opposite direction. Such motion is considered as due to reaction to the original effort. The action, corresponding to the effort and responsible for this re-bounding motion of ‘force-applying body’, is a reactive effort. This phenomenon produces elastic collisions.

If the external effort has caused certain additional distortions in the matter field of ‘force-receiving body’ and the matter field of ‘force-receiving body’ returns less additional work to the matter field of the ‘force-applying mechanism’, collision between ‘force-applying mechanism’ and ‘force-receiving body’ is not fully elastic. Certain magnitude of additional work, in the matter field of the ‘force-receiving body’, is retained. That is, matter field of the ‘force-receiving body’ is modified permanently with certain magnitude of additional distortions. There is no change in the quantity or state of both macro bodies’ matter contents. Any change of state of (motion of) a macro body, due to an external effort, is not of its matter content, but of its matter field. A change of state of the matter field, at times, may cause changes in the matter content of a macro body, due to some other reasons associated with changes in its matter field. Thus, it is possible that an external effort may sometimes affect the matter content of a macro body, indirectly.

Let us consider a larger effort, acting directly on a macro body, for longer time and the ‘force-applying mechanism’ remains stopped in position, relative to the macro body, after its action. Every (additionally) deformed latticework squares in the matter field of the macro body now strains against each other to regain its original shape. As the ‘force applying mechanism’ is not free and stays in its relative position, these latticework squares cannot regain their original shapes by moving backward and returning the additional work to the ‘force-applying mechanism’. The latticework squares can regain their original shape only by passing on the additional deformation they received, in the same direction as that of the external effort. Each latticework square of the matter field passes on its additional deformation to the latticework square next to it, in front. This is over and above the additional distortions passed on during the reception of action of effort. These additional distortions are part of the original additional distortions absorbed by each latticework square. By transferring all additional distortions, gained during action of external effort, the latticework squares nearest to the ‘force applying mechanism’ are restored to their stable state first, followed by subsequent latticework squares. Thus, the whole matter field of the ‘force-receiving body’ moves forward by a distance equal to the distance penetrated by the ‘force-applying-mechanism’ into its matter field. Only the additional distortions in the latticework structure are transferred, the latticework squares of the 2D energy fields themselves remain in their relative positions.

Let the first latticework square, immediately next to the ‘force-applying mechanism’; fully regain its original shape by transferring all its additional distortions to the latticework square in front, before the ‘force-applying mechanism’ is removed. That is, the macro body (its matter field) has moved away from the ‘force-applying mechanism’ by a distance equal to the distance penetrated by the ‘force-applying mechanism’. All of additional distortions, introduced into macro body’s matter field by the external effort, are now contained within the matter field of the macro body. These additional distortions continue to be transferred in forward direction. Thus, whole of the matter field (the macro body) continues to move in forward direction at the speed at which the additional distortions are transferred within the matter field. 3D matter particles of the macro body are carried along with the matter field. The ‘force-applying mechanism’ acted on the ‘force-receiving body’ to produce this motion of the macro body. Motion of the macro body will continue as long as the effects of this action, in the form of moving additional distortions, remain within the matter field of the macro body.

As soon as a macro body starts to move (or when its linear speed exceeds the linear speed of ‘force-applying mechanism’) in the direction of an external effort, it may sever its contact with the ‘force-applying mechanism’. External effort is not acting on the matter field-latticework squares any more and the latticework squares are not restricted from regaining their stable and original shape by expanding in opposite direction, rearward to original effort, also. This is done and the additional distortions introduced into the matter field are now transferred not only in forward direction but in backward direction as well. Additional distortions, introduced by the external effort, are now fully contained within the matter field of the moving macro body. These additional distortions are being transferred in both directions, forward and backward, so that 2D energy field-latticework squares, outside the matter field, may regain their original stable state.

However, the matter field as a whole (and along with the matter particles in it) is moving (after the action of the external effort) at certain speed in forward direction. Let the magnitude of this speed equal the magnitude of speed, at which certain portion of additional distortions in the matter field are being transferred in backward direction. Then the result is that, all the latticework squares leaving the limit of matter field to the rear would have regained their stable/undistorted state (natural distortions due to macro body’s matter content would be carried along with the macro body). In addition, all those latticework

squares entering the limit of matter field from the front would have gained an equal magnitude of additional distortions as is being lost from the latticework squares leaving the matter field to the rear. Total additional distortions, introduced into the matter field by external effort, are now confined within the matter field. It is distributed within the matter field, such that the latticework squares towards the rear part of matter field have maximum additional distortions and additional distortions in latticework squares, towards the limit of matter field in forward direction, gradually diminish until there are no additional distortions in the latticework squares just outside the limit of the matter field, in front. Latticework squares in the matter field, to the rear, also lose additional distortions and attain their stable state within a short distance from the macro body. Speed of the macro body, at which this stable condition is reached, is the linear speed imparted to the macro body by the action of the external effort. Hence, as long as the additional distortions remain within its matter field, a macro body will continue to move in a straight line at a constant velocity.

While the macro body and its matter field moves forward, it leaves behind undistorted 2D energy field latticework squares. Those 2D energy field-latticework squares, entering the space of the body-limits from the front (due to macro body's forward motion), are distorted by the same magnitude as the magnitude of additional distortions being transferred to space from the rear of the matter field. Once this process has started, there is nothing in the matter field or outside it, which can reduce or stop the motion of the macro body. To arrest the movement or reduce the speed of a macro body in motion (under inertial action), it is necessary to remove or reduce the magnitude of additional distortions invested into its matter field. This may be done by introducing additional distortions of equal or lesser magnitude in opposite direction (by an equal or lesser magnitude of external effort in opposite direction) into the macro body's matter field to neutralize or reduce additional distortions in macro body's matter field.

Consider the 'force-receiving body' as an immovable macro body (extremely large and dense compared to the 'force-applying body'). On impact, matter field of the 'force-applying body' will transfer whole of additional distortions in its matter field, to the matter field of the 'force-receiving body' and come to a halt, near or inside matter field of the immovable macro body. Additional matter field-distortions, transferred into matter field of immovable 'force-receiving body', try in vain to move the force-receiving body. Initially, additional distortions enter the matter field of 'force-receiving body' by compressing its matter field-latticework structure. However, since these additional distortions are unable to move 3D matter particles of 'force-receiving body', its matter field-latticework structure will tend to regain their stable state by de-compression (expanding in opposite direction). In this process, whole of the additional distortions transferred into the matter field of 'force-receiving body' are transferred in opposite direction and out of spatial limits of 'force-receiving body'. If the 'force-applying (or any other) macro body' is in the path of this transmission, this body will receive additional distortions into its matter field and develop a linear motion in the direction opposite to its original motion. If the 'force-applying (or any other) macro body' is not present to receive rebounded additional distortions, these distortions will be lost into space. Normally, time required for the return of additional distortions from immovable macro body's matter field is so little that the rebounding additional distortions will find the 'force-applying body' in its path.

Since there are no rigid or immovable macro bodies in nature, transfer of inertial actions from one macro body to another is a combination of the two cases explained above. Additional distortions received into matter field of 'force-receiving body' distribute and stabilise during inertial period (time delay). Changes or reduction in the magnitude of additional distortions in the matter field of 'force-applying body' also require re-distribution and stabilisation. This is also an inertial action.

Magnitude of additional distortions, produced in the matter field of 'force-receiving body', are work-done and the additional stress developed due to them, about matter field of 'force-receiving body', is the energy received by the macro body. Reduction in the magnitude of additional distortions in the matter field of the 'force-applying body' is work-undone and the magnitude of stress reduced in its matter field is the energy given away. In a case, where action of one macro body changes the state (of motion) of another macro body, magnitude of additional distortions in the matter field of 'force-applying body' is reduced and magnitude of additional distortions in the matter field of the 'force-receiving body' is increased. That is to say, that the work is undone in the 'force-applying body' and work is done on the 'force-receiving body'. Work-done and work-undone are equal in magnitude. This gives rise to the phenomenon of 'conservation of momentum'. Energy lost by the 'force-applying body' is equal to the energy gained by the 'force-receiving body'.

Work-done in the matter field of ‘force-receiving body’ is due to a (direct) ‘force’ and alteration to the matter field of the ‘force-applying body’ is due to the (reactive) ‘force’. Magnitude of additional distortions received by the ‘force-receiving body’ is the same as the magnitude of distortions lost by the ‘force-applying body’. Hence, numerically an action is equal to the reaction. Direction of resultant distortions in the matter field of the ‘force-receiving body’ and the body’s inertial displacement is along the direction of the original effort. Direction of resultant distortions in the matter field of the ‘force-applying body’ is opposite to the direction of the original effort.

If there are two (or more) external efforts acting simultaneously on a macro body in different directions, each of them will introduce its own additional distortions in corresponding directions into macro body’s matter field. Each set of additional distortions tend to move 3D matter particles of macro body in its own direction of transfer. The macro body tends to move simultaneously in more than one direction, with its 3D matter particles moving in a resultant direction. As the macro body moves in resultant direction, its 3D matter particles are displaced away from the paths of (both) sets of additional distortions, introduced by external efforts. Additional distortions, introduced by external efforts will move straight out of macro body’s matter fields (each set in its own direction) and they will be lost into space. They can affect 3D matter particles only as long as the 3D matter particles are on their way. But in the mean time, motion of 3D matter particles of the macro body, in resultant direction of external efforts, create fresh distortions in macro body’s matter field. These additional distortions, though created by the motion of 3D matter particles, move at the same speed as the 3D matter particles. It will be these additional distortions, which tend to maintain linear motion of the macro body and its 3D matter particles from now on.

Only gravitational efforts act evenly on a macro body. Field forces and inertial efforts usually act evenly on a macro body, in cases, where the ‘force-applying mechanism/body’ is much larger than the ‘force-receiving body’. In other cases, external efforts are applied to only a part of the ‘force-receiving macro body’. Additional distortions are passed on into limited region in the matter field of ‘force-receiving body’. 3D matter particles in this region attain motion corresponding to additional work gained by the body. Due to integrity of the macro body, motion of part of its body is restricted by viscosity of the body-material. Field forces, developed between ‘moving’ and ‘non-moving’ parts of the body, tend to persuade the ‘non-moving’ 3D matter particles to move along with ‘moving’ body-particles. In this case the field forces tend to oppose the action of additional distortions received by the ‘force-receiving body’. Whole body adjusts magnitude of its motion to correspond to total additional distortions received.

However, 3D matter particle in the region of matter field that was acted by external effort do not move at linear speed corresponding to additional distortions, they received. Part of additional distortions in the region is utilised to overcome resistance by field forces towards ‘non-moving’ part of the body. Magnitude of additional distortions in the ‘force-receiving body’ is lower. But every 3D matter particle in whole body is now moving at the same linear speed. Original ‘non-moving’ 3D matter particles (of the macro body) produce additional distortions, corresponding to their linear speed in the matter field of the body. Additional distortions in the matter field are eventually stabilized at a uniform magnitude corresponding to macro body’s current linear speed.

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

When a macro body is moving under action of additional distortions, it is being displaced with respect to the 2D energy fields. Matter field of the macro body is moving. It is the additional distortions in the latticework, which are transferred in the 2D energy fields. 3D matter particles of the macro body are carried along with the matter field. 2D energy fields are in constant existence throughout the space. Therefore, wherever the macro body is in space, it has similar 2D energy fields about it. Moreover, the 2D energy fields are (considered as) functional entities with respect to the 3D matter bodies. Hence, it is impossible to determine a relative motion between a 3D macro body and the 2D energy fields. We may determine a macro body’s motion with respect to other macro bodies or other references in 3D spatial system. 2D energy fields (universal medium) in this concept are the equivalent of ‘aether’ in ‘aether theories’ or ‘fields’ in ‘field theories’. Constituent 3D matter particles of the macro body are moved with respect to the 2D energy fields. Although the 2D energy fields are steady in space, it is the moving additional distortions in them, which are moving the 3D matter particles of a macro body. Because of this arrangement, even though the 3D matter particles are moving with respect to static 2D energy fields, no

resistance is offered by the 2D energy fields to the motion of the macro body or its body-particles. A macro body, moving through the 2D energy fields, does not suffer drag or resistance from the universal medium. We will not be able to detect an ‘aether drag’ or ‘aether wind’ about a moving macro body, however large the compound-macro body may be or however fast its motion may be. Because, the equivalent of ‘aether’ in this concept (the 2D energy fields), does not move themselves but move a macro body by its actions. However, since distortions in the 2D energy fields are moving along with the macro body’s 3D matter particles, effectively, there is no relative motion between the macro body and the 2D energy fields.

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 the external effort is terminated. Additional work, introduced into the matter field and not yet stabilized before the termination of the external effort, continues its stabilization in the 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 the instantaneous direction of motion of a macro body, moving in a circular path, is tangential to the circular path at any location of the body in the circular path. In reality, instantaneous direction of motion of a macro body, moving in circular path, is deflected outward from the tangent to the curved path [See article ‘Motion in circular path’]. Radial component of macro body’s motion gives rise to imaginary external effort ‘centrifugal force’. Fictitious efforts (like the centrifugal force, currently called as inertial forces), invoked by imagination of an observer to maintain the 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, additional distortions in a matter field can be transferred only in a straight-line. Each 2D energy field, passing through a macro body, transfers additional distortions in its own plane. Hence, all inertial motions are in straight lines (or in case of rotational motion, in combinations of straight lines). Linear inertial motion of a macro body will continue indefinitely in a straight line until the macro body is affected by another external effort.

Once, certain magnitude of additional distortions are introduced into the matter field of a macro body, it remains permanently within the matter field and continues keep the macro body in its current state of motion indefinitely, until the additional distortions are lost, modified or removed (neutralized by additional distortions in opposite direction) from the matter field by an external effort. Since the additional distortions (introduced by external source and moving the matter particles) in a matter field are associated with the 3D matter particles, speed of their transfer is limited by the magnitude of additional distortions. Hence, a macro body may move at any speed, lower than the maximum permitted speed by the 2D energy fields (less than the speed of light). As the speed of a macro body approaches the speed of light, constituent matter particles of the macro body break down to inferior particles until macro body’s speed reaches the speed of light [1]. At the speed of light, only photons from the macro body can survive. Beyond this speed no matter particle can move. This limits the speed of 3D matter bodies in space to less than the speed of light. Gradually, even the photons revert back to quanta of matter in the 2D energy fields.

Since a 2D energy field extends only in one plane, no latticework-distortion can be transmitted directly into the 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 the same location. Distortions in all these 2D energy fields, act on the 3D matter particle in their respective planes to move the matter particle. The 3D matter particle, being three-dimensional, produces additional distortions in all the 2D energy fields occupied by it, during its motion. In this way, distortions in one 2D energy field may be transferred or transmitted to other 2D energy fields, indirectly. An effort, (presumably) acting, through the medium of 2D energy fields, on a 3D matter particle has its components in one or more of the 2D energy fields in the planes occupied by the particle. Each 2D energy field transmits distortions only in its plane. Such actions by various 2D energy fields, occupied by a 3D matter particle, together, produce a straight-line transmission of 2D energy field-distortions in the 3D spatial system.

### **Geometrical representation:**

In figure 1, ABDC (shown in red dotted lines) is an undistorted 2D energy field-latticework square. All junction points of an undistorted latticework square are under equal stress from the latticework

structure. Consider a hypothetical external effort, acting on the latticework square at the junction point C, in addition to the stress from the latticework, as shown by the arrow; F. Junction C is displaced in the direction of external effort to C'. Other junction points, though under stress from the latticework, are free to move. They are displaced as per physical laws applicable to latticework. Distorted position of the latticework square is shown by A'B'D'C'. Distortion in the latticework square continues to increase at a rate corresponding to the magnitude of external effort. Due to the latticework structure of 2D energy field, distortion of a latticework square is transmitted in the direction of the external effort. Latticework square nearest to the point of application of the external effort has maximum distortion.

Now, let the external effort, F, be withdrawn. Since the external effort is not present any more, reactions at the junction points tend to reduce distortions and bring the latticework square, back to its stable state. Under reaction from latticework structure of 2D energy fields, junction points A' and D' tend to move inwards and junction points B' and C'' tend to move outwards. Junction point C'' moves at a faster rate than the junction point B'. Let A'B'D'C' be the resultant shape of the latticework square after the removal of external effort. The latticework square has not regained its stable state but it remains permanently distorted to certain extent. Magnitude of this permanent distortion is the magnitude of additional work-done by the external effort, during its action. Due to the latticework structure of the 2D energy field, a distortion cannot remain static in

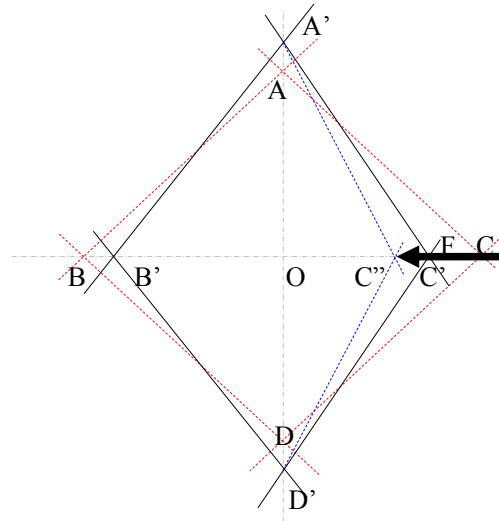


Figure 1

space; it will be transferred in the direction of the external effort. As this permanent distortion is transferred through the latticework, the matter field-distortion is said to be transmitted through space.

After removal of external effort; distortions in the locations of quanta A'C'' and D'C'' are reduced to bring them to positions A'C' and D'C', respectively. Differences between their positions (distance between C'' and C') is the accelerating component of additional work, available during the action of external effort. Distortions in the latticework structure reach a stable state (with permanent work invested in it) only after the accelerating component of additional distortion ceases to exist. Thereafter, additional distortions in the latticework are transferred at a steady speed, but without changes in their magnitudes. Displacement of the additional distortions displaces the macro body's matter field. The matter field carries all 3D matter particles of the macro body along with it. Displacement of the matter field and the 3D matter particles produce the whole-body motion of the macro body in space. Magnitude of total additional distortions in the matter field of the macro body remains steady till they are removed, modified or lost (partially or fully) due to action of another external effort on the macro body.

Figure 2, shows four 2D energy field-latticework squares, A, B, C and D in a straight line, in a matter field. G, H, K, M and N are the junction points associated with the latticework squares in a matter field. An external effort acts on these latticework squares from the right, as shown by the arrow; F. Disregarding intrinsic distortions in the matter field, latticework squares are additionally distorted from the right to left as shown in the figure. Reaction, developed at any junction point is proportional to the additional displacements of quanta of matter at the junction point. During the action of external effort, as the latticework squares are additionally distorted, latticework square, A, experiences greater reaction at the junction point on the right, N, and lesser reaction at the junction point on the left, M. Latticework-square, A, is additionally distorted towards the junction point M with lesser reaction. It is distorted to the left. Quanta of matter in the arms to the left are turned by lesser angle compared to quanta of matter in the arms to the right. Other, squares are also additionally distorted similarly to the left. Magnitudes of additional distortions and the number of distorted latticework squares in straight-line (extent of matter field) increase

as the external effort continues to act.

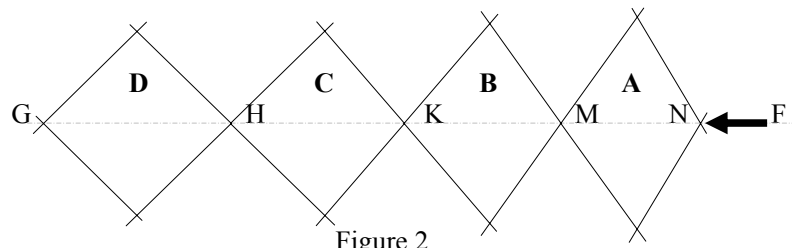


Figure 2

When the external effort is terminated, further investment of additional distortions into the matter field-latticework is also stopped. Part of the additional distortions, already introduced into the latticework, after their stabilization, remains permanent within the 2D energy fields and continues to be transferred in the same direction, creating a moving set of additional distortions in the matter field. Since there is no external effort applied from the rear, distorted latticework squares are now free to expand rearward also. Part of additional distortions in the latticework squares is nullified by rearward expansion of the latticework squares. This nullified part of the additional distortions is the accelerating component of the external effort (force), whose magnitude becomes zero after the inertial delay period.

Figure 3, shows the absolute condition of the latticework squares after removal of the external effort. G, H, K, M and N are the junction points associated with latticework squares D, C, B and A. Outer ends of latticework squares, D and A, junctions G and N, respectively, have no additional distortions and they are part of undistorted 2D energy fields outside macro body's matter field. Since there is no external effort acting from the right, the latticework squares are free to expand to the right as well as to the left. Since the external effort is removed, reaction at junction N becomes nil. Junction point M, being within the distorted part of the 2D energy field, has certain reaction in it. Latticework square A expands in the direction of lesser reaction – to the right. Similarly, all distorted latticework-squares of the 2D energy field, readjust their additional distortions to reach stable states. Additional distortions in the 2D energy field-latticework tend to spread outwards from junction point K. Let the junction K (somewhere in the middle of the distorted latticework squares), has maximum additional distortions after the readjustments. Quanta of matter in the latticework squares C and B, facing the centre line through K, have maximum displacements of all the quanta of matter in the distorted region.

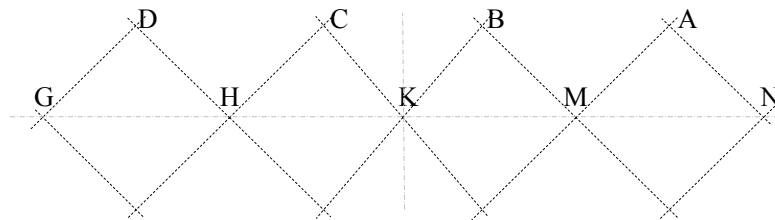


Figure 3

Junction H has lesser distortion than junction K. Latticework square, C, strains to expand. In order to expand, it has to apply greater reaction to the right and it needs to apply lesser reaction to the left. The latticework square expands in the direction (to the left), in which it requires less reaction. Latticework square C expands to the left. Junction H is displaced to the left, with respect to junction K. Distortions of quanta of matter at the junction, which are part of the latticework square D and hence the additional distortions in the latticework square D increases. Part of this additional distortion is now transferred to the latticework square to the left of D. Similarly, additional distortions in the latticework squares, to the left of junction K are transferred to the left. Undistorted latticework squares to the left of the region are newly distorted. This process transfers the additional work invested in the region, in forward (leftward) direction within the latticework structure of the 2D energy field.

Expansion of latticework square C to the left reduces stress in its arms at junction point K. Latticework square B, which tries to expand to the right, now has lower stress at its leftward junction point, K. Anchor

point of latticework square B, to expand itself, is now changed from junction point K on the left to the junction point M on the right. Latticework square B expands to the left instead of to the right, as shown in figure 3. Although the latticework square B expands as shown in figure, junction point M does not shift from the location as shown in figure 2. Expansion of the latticework square is realized by the shifting of junction point K to the left. Similarly, the latticework square A also expands to the left and keeps the junction point N in place.

Additional distortions in the latticework squares, with respect to 2D energy fields outside the region of transfer of additional work, are as shown in figure 3. Maximum distortion density is at the rear region of distorted latticework squares. Towards the forward end of the region, distortion density reaches minimum. Latticework squares, just outside the region, have no distortions and they are parts of undistorted 2D energy field. Similarly, latticework squares, outside the region, to the rear has no distortions in them. Additional distortions in the latticework squares, with respect to each other, remain as shown in figure 3. They are in their steady states after removal of accelerating component. These additional distortions (in a matter field) are transferred in forward direction without changes in relative distortion-densities. With respect to the latticework squares, magnitude of distortions in the latticework are maintained, while they are being transferred in the 2D energy field, to the latticework squares in front. 2D energy field or its latticework squares do not move along with the additional distortions but only the additional distortions (work) in the 2D energy field are transferred.

With respect to the extent of 2D energy field, outside the region of matter field, latticework squares in front are newly distorted and latticework squares at the rear are relieved of all additional distortions. They appear as shown in figure 3. All steady state-distortions are confined to the limit of the matter field, shown by latticework squares C and D. Additional distortions are also extended to the right, of this region, as in latticework squares A and B. Additional distortions in latticework squares A and B reduce as the matter field is transferred to the left. Matter field is constantly transferred in a straight line through a 2D energy field, which is stationary (in space) but for small displacements of the quanta of matter in place. Although the additional distortions are transferred within each 2D energy field, the 2D energy fields (as a whole) remain steady in space. This is the method of transfer of a matter field (work/distortions) through 2D energy fields, which carry associated 3D matter particles along with them.

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

Consider a small hypothetical direct (point) effort, being applied to a junction point of a latticework square of matter field of a macro body. To do work, there has to be a movement. Assuming the point of application of this effort has moved the junction point by a small distance, along with other quanta of matter attached to the junction point, the effort can be regarded to have acted on the macro body. Certain additional work is done in the matter field of the macro body by making a change in its matter field, namely, movements of certain quanta of matter in relation to others. Movements, produced in the matter field, are that: the first latticework square in the line of external effort is deformed to a maximum (corresponding to the strength of the effort), the next latticework square to a lesser degree and the next latticework square to a still lesser degree and so on, up to the range of force. This process continues until a latticework square at certain distance from the point of application of the effort does not receive any deformation at all. Each square of the latticework preserves certain amount of additional distortion in it and passes on the rest. After, whole of the additional distortions are absorbed in the latticework squares, subsequent latticework squares do not feel action of the effort at all. This makes a direct inertial effort, applied on a body, to be of limited range. Range of direct inertial action is limited to within the matter fields (macro bodies) in direct contact. Any action at a distance through empty space is an impossible proposition for two reasons. One reason is that there is no empty space. Second reason is that range of inertial action is limited to within macro bodies (matter fields), which are in direct contact.

If action of an external effort continues or its magnitude is increased, the magnitude of strain in the matter field latticework squares 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.

Additional deformations of latticework squares, produced by an external effort, may be regarded as temporary work-done on the macro body. These additional distortions remain with the 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 the macro body, etc. are the result of reactions from the matter fields to the additional distortions, introduced into them.

### **Conclusion:**

Inertia is a property of universal medium (2D energy field), caused by its latticework structure. Certain time delay required, during the action of an effort (force), for stabilization of distortions in the all-encompassing universal medium - the 2D energy fields. 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 the observable fact that a macro (matter) body is reluctant to change its state of motion. Although the effects are observed on macro bodies, they are caused by reluctant action of universal medium. Hence, inertia is a property of 2D energy fields rather than that of matter. Inherent character of 2D energy fields to strive towards absolute homogeneity is the cause of all actions and inertia. Structure of 2D energy fields produces its mechanism of action.

### **Reference:**

References are self-published by the author. They are neither reviewed nor edited.

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