

EFFORT AND FORCE

(According to “Hypothesis on MATTER”)

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Abstract: Force is generally understood as cause of an action and result of an action is often quantified as work-done or as energy-transferred. All these terms are very vague and have no clear meanings or definite mechanisms of action. Force is considered as the primary entity and work or energy is considered as the result of action of force. The concept, put forward in the ‘Hypothesis on MATTER’, depicts force, work and energy as terms with clear meanings. An external effort has a definite mechanism to transfer work from a force-applying body to a force-receiving body. This article intends to give very brief description of various terms, used in conjunction with physical (motion) actions as envisaged in the above mentioned concept. An effort is the cause of an action. Action of an effort transfers work from one macro body to another macro body. Work about a macro body is the distortions in the all-encompassing universal medium about it. Stress developed due to distortions in universal medium about a macro body is the energy stored in and about the macro body. Work is the primary entity and it is real. Force (or power) is the rate of work (being changed by the action of an external effort) and energy is the stress (in the universal medium about a matter body) due to the work. Force and energy are functional entities describing certain aspects of work. For details, kindly refer to [1].

Keywords: Effort, force, work, energy, quantum of matter, 2D energy field, inertia, Hypothesis on MATTER.

Introduction:

‘Hypothesis on MATTER’ describes an alternative concept. In it: the matter content of a body and the energy about the body are distinctly separate. Matter content is the total sum of three-dimensional matter in a body. Energy is the stress developed due to ‘distortions’ in the natural arrangements of basic ‘quanta of matter’ in and about a matter body. Matter content and energy content of a body cause and support each other for their existence and stability. They are not convertible into each other.

Entire space is filled with ‘2D energy fields’, two-dimensional latticework structures by 1D quanta of matter, in all possible directions. Parts of 2D energy fields within spatial dimensions of a macro body contain sufficient distortions to sustain macro body’s integrity and stability in its current state. This part of

2D energy fields about a macro body is its ‘matter field’. Additional distortions in the matter field of a macro body, over and above distortions required to sustain stability and integrity of the macro body and its constituent matter particles, are the ‘additional work’ existing about the macro body and it determines macro body’s state of motion. All apparent interactions between 3D matter particles or 3D matter bodies take place through the medium of 2D energy fields. This avoids the illogical assumption of ‘actions at a distance through empty space’. 2D energy fields fill the entire space. It is an (aether-like) all-encompassing universal medium, but with definite structure and properties. Matter is incapable of any actions or movements on its own. It is the inertial actions of 2D energy fields about a matter body, which move the matter body and conduct all actions, which are currently attributed to matter bodies. All actions are directly between 2D energy fields and 3D matter particles. Simultaneous actions between universal medium and 3D matter particles in different macro bodies appear as interaction between the macro bodies.

A quantum of matter, a very small bit of matter, is postulated as a real matter particle that has positive existence in space. No other imaginary particles or assumed properties are envisaged in this concept. Each quantum of matter is an independent matter-body and it keeps its individuality under all conditions. Entire space is filled with quanta of matter in definite structural formations. [Space is a functional entity that indicates the place of existence of matter. Space has no other functions. Since the space has no physical form or structure, it cannot undergo physical transformations. However by having a universal medium to substitute for functional entity, space, it gains reality.] Due to adhesive property of its matter content, a free quantum of matter tends to grow in one spatial dimension, while reducing its measurements in other spatial dimensions. Reducing the length of a free quantum of matter by external means compels the quantum of matter to grow into second spatial dimension. Similarly, reducing the area of a 2D quantum of matter in its spatial plane compels it to grow into third spatial dimension. If left free, in free space, a quantum of matter will grow in length indefinitely.

During lengthening process of a free quantum of matter, if its ends come in contact with other quanta of matter, in its spatial dimension, lengthening process of the quantum of matter is restricted. Matter contents of the quanta of matter, in contact in the same spatial dimension, interact to move both quanta of matter towards each other’s ends, together to form a junction and turn the quanta of matter to bring their bodies in a straight line. In this manner, free quanta of matter in space tend to form one-dimensional chains. Due to frequent break downs of these chains and availability of free quanta of matter to migrate into 1D quanta-chain, there are far too many quanta of matter in any quanta-chain. Excess numbers of quanta of matter, in chains, hold constituent quanta of matter of the chain at reduced lengths in their one-dimensional status. Tendency of quanta of matter in quanta-chain, to grow in length, keeps all quanta of matter in quanta-chains compressed from their ends. Quanta of matter in different spatial dimensions, but passing through the same point in space, coexist at the point.

More than two quanta of matter, forming a junction settle around the junction point, in same plane, with equal angular difference between neighbouring quanta of matter. However, junction points with four quanta of matter (neighbouring quanta perpendicular to each other) provide most stable configuration. For this, quanta-chains in a plane, settle perpendicular to each other and crossing at the junction points to form latticework-structures called a 2D energy fields. A 2D energy field extends infinitely in its plane, in all directions in space. Distortions of limited magnitude are tolerated within the latticework of a 2D energy field. During distortions, quanta of matter at a junction point are angularly deflected and/or vary their length. Distortions invoke reactions in latticework structure to restore its stable configuration. In its stable state, a 2D energy field is isotropic, homogeneous, serene, self-sustaining and steady in space. 2D energy fields make ideal universal medium that fills the entire space. They provide an all encompassing universal medium that create and accommodate all 3D matter bodies. 2D energy fields have perpetual existence. They conduct all apparent interactions between matter bodies, store and deliver energy associated with matter bodies and conduct all necessary functions to sustain the universe in its steady state.

Due to the latticework-structure of a 2D energy field and its inherent property of stabilization, distortions in a 2D energy field are bound to spread-out. If there is an external cause, distortions tend to be transferred in the direction of the cause. Sequential spread of distortions, from one latticework square to the next, introduces a time delay in the development and transfer of distortions in 2D energy fields. This property of time delay, during development and transfer of distortions and constant speed of their transfer through 2D energy field, give rise to the property of inertia. Inertia is a property of universal medium, rather than a property of matter bodies.

Displacements of quanta of matter (including the changes in their lengths) are tangible in 2D spatial system. They constitute ‘work’. Stress, produced in the latticework-structure of a 2D energy field, by distortions is the ‘energy’ associated with the work. Energy, as such, has no independent existence in any form. Rate of distortions (work) being introduced into a region of 2D energy field (associated with a matter body) is ‘force’ or ‘power’. Since force is a rate of work, cause of an action (which causes the work) may be termed as an ‘effort’. Ultimately, displacements of matter bodies, in 2D energy fields, are produced by transfer of latticework-distortions from higher distortion-density region to lower distortion-density region in 2D energy fields. Mechanical re-arrangement of quanta of matter in 2D energy fields is the action of an effort. Whichever is the manifestation of effort (gravitational, electromagnetic, nuclear, inertial, etc.); they have only one type of mechanism and they act in similar manner. Thus, fundamentally, there is only one type of effort (natural force) in nature.

Constituent quanta of matter in a 2D energy field are held under compression from (both) their ends. A local break down in a 2D energy field creates a gap in it. Quanta of matter, which occupied the region of gap (as part of latticework structure), are released from latticework, to be free floating bodies within the gap. As soon as these quanta of matter become free, they start to grow in their single-spatial-dimension to increase their lengths, while attempting to regain their positions in the latticework structure. In the mean time, due to inherent compression, quanta-chains will grow into gap and reduce area of the gap. As a result of reduced area of gap, many of the free quanta of matter in the gap will not be able to migrate back into latticework structure of the 2D energy field. Quanta of matter, which are unable to gain their position in latticework structure, are gathered together, within the gap, by encroaching quanta-chains. These free quanta of matter are gathered and compressed by 2D energy field, until combined body of free quanta of matter become a circular 2D matter body (a disturbance) within the 2D energy field. Tendency of the 2D energy field, to grow into a gap in it, is the gravitational action. While doing so, quanta-chains push at any entity within the gap. If the matter content of 2D disturbance is more than certain limit, compression on the disturbance by gravitational pressure compel constituent quanta of matter in the disturbance to grow into their third spatial dimension. A disturbance, growing into the third spatial dimension, creates real 3D matter. All higher dimensional matter bodies are disturbances with respect to 2D energy fields.

Gravitational effort is exerted by a 2D energy field in the direction away from quanta-chains, which are exerting the effort. It is of push nature and its magnitude is proportional to the extent of 2D energy field that is applying the effort. Gravitational effort can act only on curved perimeter (surface) of a disturbance. If there are more than one disturbance in a 2D energy field, extents of 2D energy field on their outer sides are greater than the extent of 2D energy field in between them. Hence, these disturbances experience greater gravitational efforts on their outer sides, compared to gravitational efforts, experienced on their inner sides. Resultant of these gravitational efforts tends to move the disturbances towards each other. This is gravitational (apparent) attraction.

If distortion-densities (in 2D energy fields) on opposite sides of a 3D matter particle are different, distortions tend to redistribute by moving in the direction of lower distortion-density region. While doing so, distortions in the 2D energy fields carry the 3D matter particle, along with them. This causes inertial displacement of the 3D matter particle in space.

Larger 2D disturbances are compressed by 2D energy fields into their 3D state. During creation of a 3D disturbance, unevenness of gravitational action on its surface causes ejection of the 3D disturbance (in full or in part) from the 2D energy fields of its creation. 3D disturbance can never escape from being simultaneously in many 2D energy fields. Therefore, ejection of a 3D disturbance from 2D energy fields of its existence is a continuous process. This creates the inherent property of a 3D matter particle to move in linear path in space. The moving 3D disturbance is disc shaped and its radial size is maintained at a critical value, which is common to all moving 3D disturbances. Asymmetry of ejection force on ejected 3D disturbance initiates its spin motion about one of its diameters. Eventually, gravitational actions on the 3D disturbance move it at a constant (highest possible) linear speed and spin it at an angular speed proportional to its matter content. In order to move a 3D disturbance, 2D energy fields exert gravitational effort by creating latticework-distortions in the region, surrounding the 3D disturbance. All work (energy) required for creation and motions of a 3D disturbance are stored in the 2D energy field-distortions, associated with it. As these distortions are transferred through 2D energy fields at the highest possible linear speed, 3D disturbance is also carried with the distortions. This 3D disturbance (matter-body, moving at a constant linear speed and spinning at an angular speed proportional to its matter content) and its

associated 2D energy field distortions (inertial pockets), together, form a photon. A photon is a corpuscle of light or other similar radiations. Inertial pockets, about a photon's matter-body in any plane, have many similarities with electromagnetic waves. This gives a photon, its dual nature on being a matter corpuscle with associated electromagnetic wave. A photon is the basic 3D matter particle. All other superior matter bodies, including fundamental particles, are made up of photons, in various combinations.

Two (complimentary) high-matter content photons, under suitable conditions, combine like a binary unit of spinning bodies (spinning about a common axis), moving in circular path about a common centre. This unit is a primary particle called biton. Bitons, in turn combine to form fundamental particles, atoms, molecules, etc., to form macro bodies. Each matter particle of a macro body has its constituent photons and associated inertial pockets. Due to the curved paths of photons in bitons, their inertial pockets are permanently in unstable states. Unstable inertial pockets of constituent photons combine to form 'distortion field' of a biton. Distortion fields of all matter particles in a macro body, together, form 'matter field' of the macro body. Matter field of a macro body contain enough distortions in it, to sustain stability and integrity of its matter particles and combined body in its current state. Due to latticework structure of 2D energy fields, matter field of a macro body extends outside its body-dimensions. Magnitude of this extension depends on the size of macro body and the distortion-density of its matter field.

All conclusions expressed in this article are taken from '*Hypothesis on MATTER*' [1]. For details, kindly refer to the same.

Effort:

Effort is the cause of an action. In conventional physics, use of the term 'force' is related to the rate of action rather than the action itself. However, in general terms, 'force' and 'effort' are synonymous. Efforts may appear to act in different ways on matter bodies. Widely accepted method of an effort's action is to cause a matter body's motion in space, a change in the state of motion of a matter body. In this case, term 'force' is used to indicate the cause of action. Actions of efforts cause changes in many other states of matter bodies, like; creation and sustenance of 3D matter, structure-development and stability of fundamental matter particles, structure and sustenance of macro bodies, temperature variations in matter bodies, development of internal pressure of macro bodies and their explosions, matter and energy radiations from macro bodies, etc. Hence, the term 'effort' has wider meaning compared to the term 'force'. Effort may cause changes in different states of matter bodies in addition to changes in their states of motion.

Whatever case it may be, action of an effort is to vary the magnitude of work associated with a matter body. Work associated with a matter body is also expressed as energy contained in the body. There is only one way to develop or transfer work by action of an effort. Mechanisms of effort's actions are also similar in all cases. Hence, fundamentally there is no difference between various types of efforts, known in physics as natural forces. Different natural forces (gravitational, electromagnetic and nuclear forces) are different manifestations of same type of efforts. Present classification of efforts indicates their association to various phenomena rather than fundamental differences between them.

Momentum:

Quality of a motion may be understood by its impetus. Impulsion of a body's motion is directly related to its velocity and matter content. This relation is generally known as momentum. Momentum is product of the mass (representing matter content) of a body and its velocity. Since mass of a body is not always proportional to its matter content, above relation is true only for relatively low values of body's velocity. If effect of velocity on the mass of a body can be neglected, changes in momentum are the result of changes in velocity only. Momentum of a body is equivalent to the force required to bring the object to a stop in a unit length of time. Momentum of a body is the sum of momenta of all 3D matter particles in the body. Being proportional to velocity, momentum of a body has a direction.

In a rotating body, the momentum of each particle (away from axis of rotation) has a moment about the axis of rotation of the body. This is generally known as moment of inertia of the particle. Impulsion of a particle in a rotating body has a relation to its distance from axis of rotation. Sum of the moments of momenta of all particles is called the angular momentum of the rotating body, about the axis of rotation. It is equal to the product of the moment of inertia of the body about the axis and the angular velocity of the body.

Work:

Each (basic) 3D matter particle of a macro body is associated with sufficient 2D energy field-distortions to maintain its stability, integrity and states of motion. Distortions in 2D energy fields about a macro body are the work associated with the body. In order to produce distortions in 2D energy fields, constituent quanta of matter are displaced (displacement includes changes in body-dimensions also) with respect to each other. Displacement in space is a tangible parameter. Due to extremely small sizes of quanta of matter in 3D space system, their displacements are tangible only theoretically. However, since they are tangible, displacements of quanta of matter are real. Distortions in 2D energy fields, about a macro body, are tangible and they constitute work-done about the macro body. This makes the work, a real entity.

Every constituent 3D matter particle in a macro body is under constant motions. Each of these matter particles has work associated with it, to maintain its stability and integrity. Distorted region in 2D energy fields about a macro body is its matter field. To consider a macro body (as a whole) for mechanical considerations, we may neglect 2D energy field-distortions about individual 3D matter particles and take only those distortions, which affect the whole body as a single unit. These whole-body matter field-distortions have no separate existence. They integrate with distortions about individual 3D matter particles (required to produce necessary changes in their states), so that the resultant of their changes produces changes in the state of macro body. Hence, in a wider sense, we may consider only those additional distortions, which cause changes in whole-body state (of motion) as distortions in the matter field of macro body.

In mechanics, state of a macro body is normally considered only with respect to its motion. Although, states of a body in other respects (like internal pressure, matter density, physical existence, temperature, etc.) depend on states of motion of individual 3D matter particles within macro body, we may neglect them in this article. This article considers topics related only to action of effort (force) on macro bodies. State of motion of a macro body depends on magnitude and nature of additional distortions, its matter field contains. These additional distortions are not created within macro body's matter field. They have to be introduced into matter field from external sources. Introduction of additional distortions into the matter field of a macro body is an inertial action. Inertial action is that action which invokes the property of inertia about a macro body.

Due to inherent property of 2D energy fields, to strive towards homogeneity, distortion-densities in different regions within 2D energy fields tend to equalize. For this, distortions from higher distortion-density region are transferred to lower distortion-density region. During transfer of distortions, 2D energy field latticework structure suffers no translational displacement. It is the distortions, which are transferred by displacements of constituent quanta of matter, in place. During such transfer, any 3D matter particle, which happens to be in that region (3D matter particles exist with in gaps in 2D energy fields), is also carried with the distortions. In free 2D energy fields, distortions are transferred at the highest possible speed. However, if the distortions have to carry 3D matter particles during their transfer, distortions change their speed and magnitude to suit the 3D matter particles. These modified distortions cause or change inertial motion of the macro body.

Additional distortions, causing inertial action on a macro body, may be transferred into its matter field from matter field of another macro body or they may be produced by creating difference in distortion-densities on opposite sides of the macro body. When a moving macro body collides with a stationary macro body, it is the matter field-distortions from the moving macro body that is transferred into matter field of the stationary macro body. Matter contents of both bodies are unaffected. Reduction in additional matter field-distortions in the moving macro body reduces its speed (decelerates the macro body). Additional matter field-distortions received by the stationary macro body initiates its motion (accelerates the macro body). Interactions between two distortion fields, associated with matter bodies, may cause difference in distortion-densities on opposite sides of a matter body. Tendency to equalise distortion-densities, by 2D energy fields, move the matter body towards lower distortion-density region. During such motion of the matter body, additional distortions appropriate to its motion are produced in the matter body's matter field. Whichever process is used, it is the magnitude of additional distortions in macro body's matter field that is changed. Hence, there are not many kinds of work in nature, but one. Force is nothing but the rate of work (additional distortions), being introduced into matter field of a macro body. Thus, fundamentally, there is only one type of effort or natural forces.

Force:

In its wider sense, the word ‘force’ is used to indicate ability or desire to cause an action. However, in physics, it is the rate of work-done on (or about) a macro body, in relation to macro body’s displacement. Force is a mathematical relation, similar to power. Since, mathematical relations are abstract terms; force is a functional entity and it has no real existence. However, we currently assign magnitude and direction to force to make it a vector quantity with real existence. On many occasions, the term ‘force’ is used simply to represent an action or cause of an action. Thus, depending up on the nature of actions, forces have also come to be segregated into different types, without considering their fundamental nature. Although, fundamentally, all types of forces (being rates of work-done) are same, we classify them into gravitational, electric, magnetic, nuclear, inertial, mechanical, etc. forces. These are various manifestations of fundamental (single type of effort) force. This classification is based not on nature or actions of forces but on nature of source of efforts, which generate forces.

The term ‘force’ is related to changes in the states of motion or shape of a body. Change in the shape of a body is the result of motion of some parts with respect to other parts of a body. Efforts may change different states of a macro body. Actions and their rates, related to changes in states other than motion or shape of a macro body, are known by different names. Although efforts are instrumental to changes in all states of a macro body, term ‘force’ is associated only with changes in states of macro body’s motion or shape. Force is the mathematical relation between mass (representing matter content) of a macro body and the body’s acceleration. Hence, if either mass or acceleration, associated with the relation, is absent; force will not exist. An effort that cannot accelerate or deform a macro body does not generate force. It may cause other changes in the macro body. However, these actions are not recognised as actions involving force.

All actions of effort, related to motion of a macro body, are exhibited in 3D space system as inertial force. Force is recognized only when action of an effort results in displacement or deformation of a 3D matter body in space. Since these actions invoke the property of inertia, they are inertial actions. Motion of a 3D matter body is an inertial action. Thus, all manifestations of force results in inertial action on 3D matter bodies. Inertial action on a matter body is accomplished by transfer of additional distortions in 2D energy fields about the body. Transfer of additional distortions conveys work, which is a real entity. Force, being a functional entity cannot be transferred from one point in space to another. Force comes into being only when effort acts of a body to transfer work (additional 2D energy field distortions) into matter field of a body and develop corresponding energy in the body’s matter field. During this process, a force can be said to be acting on the body. Application of an effort on a body need not transfer work into its matter field. Even if additional distortions are transferred, they need not accelerate or deform the macro body. Since there is neither transfer of work nor acceleration/deformation of the body, there is no rate of distortion-transfer and hence no force comes into being. Hence, the sentence ‘a force being applied’ is meaningless. We cannot apply a force but a force comes into being only during an accelerating/deforming action by an effort.

However, in the following explanations, term ‘force’ is also used in a general sense to indicate exchanges of (or an effort to transfer) work, force, power or energy between macro bodies. It indicates cause of an action. Action of an effort produces additional distortions in 2D energy fields about a macro body. Forces are rates of additional distortions, being introduced into matter field of a macro body. Hence, all manifestations of efforts (being related to actions caused and contained within the 2D energy fields) are ‘field forces’. All actions and interactions of efforts are the results of simple mechanical movements of quanta of matter in 2D energy fields. Stress, in the inherently stable systems of 2D energy fields, during their distortions gives rise to associated ‘energy’. Work may be transferred but energy cannot. Energy is developed at the location of work. Energy has a shadowy nature and is present wherever work is present.

2D energy fields and transfer of distortions in them affect basic 3D matter particles (photons) in them. Displacements of constituent photons (they being integral parts of a larger macro body) of a macro body, in turn, subscribe to motion of larger bodies. Field forces are primary efforts and they form basis of all other manifestations of efforts. All efforts are recognized by their inertial actions on 3D matter bodies in 3D spatial system. In order to justify present terms, used to distinguish different manifestations of effort, efforts may be classified into gravitation, field force and inertial effort. Mechanisms of working of all efforts are similar and their classifications into three main groups, in this article, are only for convenience

and clarity of explanations. Production, transmission and action of all these types of efforts are similar but within certain minor restrictions.

Gravitation:

Quanta-chains in 2D energy fields are held under compression from their ends. Difference in distortion-density, required to cause gravitation, involves a discontinuity in 2D energy fields. 2D energy fields, on either side of discontinuity, tend to push and grow into the gap provided by discontinuity, so that 2D energy fields (and their quanta-chains) may re-establish their continuity. Discontinuity in 2D energy fields may be in the form of a breach in latticework structure, a 2D disturbance or a 3D matter particle (all 3D matter particles are disturbances with respect to 2D energy fields). Tendency of 2D energy fields, to press towards discontinuity in them, distort latticework squares near the gap. If there is a difference in densities of distortions formed on opposite sides of the discontinuity, distortion-densities tend to equalize by moving distortions towards lower distortion-density region. While doing so, entities (2D or 3D disturbances) within the gap are also moved towards lower distortion-density region. Displacement of disturbance is an inertial action. Hence, we can say that during the motion of disturbance, gravitation is transformed into inertial effort.

Magnitude of gravitational effort/pressure, applied at the point of discontinuity of 2D energy fields, is proportional to the extent of 2D energy fields in the direction away from disturbance. If there are two disturbances in 2D energy fields, extent of 2D energy fields in between the disturbances is less than the extent of 2D energy fields on outer sides of the disturbances. Gravitational efforts applied on outer sides of the disturbances are higher, compared to gravitational efforts, applied on their inner sides. Distortions in 2D energy fields near the disturbances, produced by gravitational actions, are proportional to gravitational efforts. Differences in gravitational efforts/distortions tend to move both disturbances towards each other. Movements of the disturbances, towards each other, appear as an attraction between them. This is the apparent attraction due to gravitation between two disturbances. Since 2D energy fields extend infinitely in all directions, in every plane in space, apparent gravitational attraction between two 3D matter bodies are always present, irrespective of their locations in space. Apparent attraction due to gravitation is relatively a minor by-product of gravitational actions. There are some exceptions, when considering gravitational attraction between photons. Motion of disturbances, under apparent attraction due to gravitation, is an inertial action. Hence, we can say that during motion of disturbances towards each other, gravitational effort is transformed into inertial effort.

At present, apparent gravitational attraction between matter bodies is the only gravitational effect known. Gravitational action/effort and gravitational attraction are different phenomena. Gravitational action is the pressure applied by 2D energy fields (universal medium) on 3D matter particles. In fact it is the gravitational actions by 2D energy fields, which create and sustain all 3D matter particles. Gravitational attraction between two matter bodies and its apparent action is the resultant of separate gravitational actions on two matter bodies, by surrounding 2D energy fields. Resultant effect is understood as dynamic action of gravitation. However, static actions of gravitation on matter bodies are more extensive and fundamental. For details, kindly see reference [2]. Understanding static nature of gravitation will lead towards unification of natural forces.

Gravitational actions on a 3D matter body are separately by each of the 2D energy fields, which contain the body. Photons are the only one type of stable 3D matter particles. They are disc shaped matter bodies, spinning about one of their diameters. Gravitational attraction between two macro bodies is the result of gravitational attraction between their constituent photons. Gravitation is effective only on curved surfaces of photons. Magnitude of gravitational attraction between two macro bodies is the sum of gravitational attraction between photons in both bodies, which happen to have their disc planes coinciding with each other, at any instant. Number of such photons in both macro bodies is extremely few. Hence, magnitude of gravitational attraction between two macro bodies is extremely small compared to gravitational actions on them.

Action of gravitation on any matter body is independent of all other matter bodies. Gravitational action is directly between matter particle and surrounding 2D energy fields, which are in direct contact with the matter particle. Development of distortions in 2D energy fields about a matter body, which produce gravitational actions on it, is an inertial action. This takes place during development of basic 3D matter particles. Thereafter, apparent interactions between matter bodies, due to gravitation, are continuous. Any

changes in them are instantaneous. Hence, variation in magnitude of apparent gravitational attraction takes place instantly on changes of parameters or constitution of 3D matter-bodies. Changes in parameters or constitution of a matter body are carried out by developing appropriate 2D energy field-distortions about the body. Gravitational efforts on a matter body changes during development of additional distortions about the body. Such changes cause instantaneous variation in the magnitude of apparent gravitational attraction between two matter bodies, on changes of their parameters. No transfer of imaginary particles/energy from one matter body to another is required to produce changes in the magnitude of apparent gravitational attraction between two 3D matter bodies. However, changes in inertial motions of the bodies, under variations in magnitude of apparent gravitational attraction, are again subject to inertial delay. Contrary to present belief, gravitational effort is enormously stronger compared to other manifestations of effort. Development and motion of basic 3D matter particle (photon) by gravitational action is the origin of work in 3D spatial system. These are then transferred from body-to-body to do work in 3D spatial system by inertial efforts.

Field force:

Electromagnetic and nuclear manifestations of effort are included in this category of field forces. Usually, all superior 3D matter particles have resultant distortion fields about their bodies. Distortion fields are individual matter fields of constituent 3D matter particles, with permanent set of 2D energy field-distortions about them. These distortions, being maintained by repetitive actions of 2D energy fields, maintain distortion fields' individual nature and magnitude as long as status of the matter particle does not change. Field forces are related to 2D energy field-distortions in distortion fields about 3D matter bodies. As and when two distortion fields overlap, distortion-density in between the distortion fields is modified. If the modification results in higher distortion-density, compared to distortion-densities on outer sides of 3D matter bodies, transfer of distortions towards low distortion-density regions tend to move the matter bodies away from each other. This is apparent repulsion between the matter bodies. This phenomenon is assigned to 'repulsive field force'. If the modification results in lower distortion-density compared to the distortion-densities on outer sides of 3D matter bodies, transfer of distortions towards low distortion-density region tend to move the matter bodies towards each other. This is apparent attraction between the matter bodies. This phenomenon is assigned to 'attractive field force'. Apparent repulsion and apparent attraction due to field forces may cause displacement of 3D matter bodies. Displacement of matter bodies in space is inertial action. Hence, we can say that field forces are transformed into inertial efforts to move 3D matter bodies.

Distortion fields about 3D matter particles, whose interactions produce field forces, are created by motion of constituent unstable photons in superior 3D matter particles. Development of distortion fields are inertial actions. Once the distortion fields are produced, their interactions are instantaneous. In this case also, motion of a matter body due to interaction between two distortion fields is governed by inertial delay. Unstable photons in fundamental matter particles have constant linear speed, even in their curved paths. Distortion field about a primary matter particle, produced by unstable photons in it, is related to the primary matter particle. Distortion field of a primary matter particle follows the primary matter particle, wherever it moves and at the same speed as the particle. However, changes in magnitude or direction of the distortion field require new developments or restructuring of latticework squares of 2D energy fields. These are governed by inertial properties of 2D energy fields. Changes in magnitude or direction of a distortion field, producing a field force, is transmitted through 2D energy field at the only (highest possible) speed of transfer of independent distortions in 2D energy fields. This is the speed of light. A single distortion field cannot induce (inertial) motion of a 3D matter body. A 3D matter body may be moved (work is created) by field forces. Interactions between two or more distortion fields produce field forces.

Distortion fields about 3D matter particles are classified into three types. Resultant (average) direction of distortions in a distortion field is represented by imaginary lines of force with arrows in the direction of their assumed distortion. Usually directions of arrows indicate possible direction of an inertial action that can be produced by the distortion field in conjunction with another distortion field.

A distortion field, represented by imaginary linear lines of force is a magnetic field. End, from where the lines of force appear to come out of a macro body (bearing the distortion field) is North magnetic pole and the end, where the lines of force terminate near the macro body (bearing the distortion field) is South magnetic pole.

A distortion field, represented by imaginary angular lines of force is an ‘electric field’. Side of an electric field, where imaginary lines of force about a macro body (bearing the distortion field) appear in clockwise direction, is its positive electric charge. Side of an electric field, where imaginary lines of force about a macro body (bearing the distortion field) appear in anti-clockwise direction, is its negative electric charge. Electric charges are relative directions of electric fields. They have no independent existence. Every electric field has both positive and negative electric charges. Classification of electric charge of an electric field is related to location of observer.

A segment of a curve with low curvature appears to be a straight line. Electric lines of force, with low curvatures, act as magnetic lines of force. Hence, electric nature of a distortion field is exhibited only within very small distance from centre of distortion field. At larger distance between two electric fields, their magnetic nature becomes prominent. At certain distance (zilch force distance) between two electric fields, they produce no interactive field forces. On either side of zilch force distance, interactions between two electric fields produce efforts in opposite directions.

A distortion field, represented by imaginary radial lines of force, is a nuclear field. Positrons and electrons are the only two 3D matter particles, which have associated nuclear fields. Those nuclear fields with their lines of force directed radially outward (associated with electrons), away from centre of the macro body (bearing the distortion field) have repulsive nuclear field. They apparently repel all other matter bodies. Those nuclear fields with their lines of force directed radially inwards (associated with positrons), towards centre of the macro body (bearing the distortion field), have attractive nuclear field. They apparently attract all other matter bodies. Since nuclear fields or their interactive efforts can neither add nor subtract from each other, they cannot be classified according to their strengths into strong and weak nuclear field/force.

Inertial efforts:

Inertial efforts are those efforts, which give rise to phenomenon of inertia, associated with matter bodies. All efforts, giving rise to displacement of matter bodies in space, are included in this category. Inertial efforts may be derived from transformations of other manifestations of efforts or they may be transferred from matter field of one matter body to matter field of another. Inertial action is the transfer of additional distortion (work) into matter field of a macro body. This may be accomplished by transferring 2D energy field-distortions, directly from one body’s matter field of another or by deriving distortions from field forces or gravitational actions. In any case, introduction of additional distortions by action of an effort may enhance or reduce the additional distortions, already existing in the matter field of a macro body. This will modify current state (of motion) of the macro body.

All mechanical actions are recognised by displacements of corresponding matter bodies in space. Whatever be the cause of a displacement, motion of a matter body is an inertial action. For this, all manifestations of effort have to be transformed to inertial effort. An external effort, related to displacement of a matter body in space, is an inertial effort. Matter bodies move through and are moved by 2D energy fields. Hence, state of motion (and its changes) of a matter body depend on structure and actions of 2D energy fields (universal medium). Nature of these actions is governed by inertial properties of 2D energy fields. These may be different for widely spaced regions of 2D energy fields. Hence, physical constants governing inertial actions in different regions of space may not be identical.

Measurements:

Other than work and displacement, which are real entities, all other terms related to actions are functional entities. Work, being displacements of quanta of matter in 2D energy fields, is not directly tangible in 3D spatial system. Hence, all terms related to action (of motion) are derived in terms of displacements and another functional entity, time.

Quality of a motion may be understood by its impetus. Impulsion of a body’s motion is directly related to its velocity and matter content. This relation is generally known as momentum.

$$P = m v = m \frac{ds}{dt}$$

(where P is momentum, m is mass representing matter content, v is the velocity of a body, s is displacement and t is time)

Depending up on its linear speed, every 3D matter particle in a rotating macro body has certain momentum. Due to their distance from centre of rotation, they also have moments with respect to axis of rotation. Moment of momentum of a matter particle is its moment of inertia about the axis of rotation. Product of moment of inertia of a rotating body and the body's angular speed is 'angular momentum' and it is used to determine impulsion of a rotating body with respect to body's centre of rotation.

$$L = r P = r m v = m r^2 \omega$$

(where L is angular momentum, r is distance between point of application of effort and centre of rotation, P is momentum, m is mass of the body representing its matter content, v is velocity of point of application and ω is angular velocity of point of application).

'Transfer of work-done' about a macro body or 'variation in energy-stored' in the matter field of a macro body may be related to result of an effort, producing the changes. Result of an effort may be related either to the time taken for its result by transfer of distortions or to magnitude of corresponding displacement of macro body during such transfer of distortions. When rate of energy-transfer (work-done) is related to time, resulting functional entity is 'power'.

$$\text{Power} = \text{Work} \div \text{time}$$

If rate of distortion-transfer is related to body's (corresponding) displacement, resulting functional entity is called 'force'.

$$\text{Force} = \text{Work} \div \text{distance}$$

Momentum, angular momentum, mass, energy, power, torque and force are not real entities. They are mathematical relations between work-done and the matter content in a matter body under various conditions.

Work-done about a body and body's matter content are real entities. They are related to the 2D energy fields and quanta of matter. Since quanta of matter and 2D energy fields are considered functional entities (with respect to 3D beings), fundamentally, both matter content and work-done in 2D space system are also considered as functional entities with respect to 3D spatial system. For this reason, we have no dimensional measuring system, directly related to them. Available dimensional measurement systems are formulated for tangible measurements in 3D spatial system. Down to the scale of quanta of matter, measurements used in 3D spatial system are too large to be useful and magnitudes of measurements in 2D spatial system become negligible. For practical purposes, matter content of a macro body and work-done about it are considered for macro scales only. Hence, they become tangible in terms of some other functional entities used in 3D spatial system. Matter content of a macro body is represented by a functional entity called mass. Work-done is measured in terms of changes in other parameters of macro bodies.

Inertial actions transfer work-done/energy from matter field of one macro body to matter field of another. Matter contents of macro bodies are not transferred during transfer of work/energy. Work-done on a macro body, though intangible directly, is a real entity. It is intangible due to the fact that it is impossible to measure movements or displacements of quanta of matter (functional entities) in 2D energy fields. In macro bodies, work-done are measured directly with respect to their displacements in space (or changes in other parameters) as composite bodies.

We have no absolute reference to base a dimensional measurement system to measure matter content of 3D bodies. Hence, we have come to depend on indirect measurements to represent matter content of 3D bodies in terms of other derived dimensional measurements. While doing so, states of matter body, other than its state of motion are not taken into consideration. This has led to few illogical conclusions.

Energy:

During action of an effort, work is transferred into or removed from matter field of a macro body. Quanta of matter in the body's matter field are displaced with respect to their neighbours in their latticework structure; over and above displacements, they already possess. Relative displacement of a quantum of matter in the latticework structure varies divergence angle between constituent quanta at

lattice-work junction points. All quanta of matter at distorted junctions are strained. It is their natural tendency, to return to stable states with respect to each other. Stress, developed in the quanta of matter (at a lattice-work-junction point) due to displacement of one or all quanta of matter at a junction point, remains with lattice-work structure until all quanta of matter (at lattice-work-junction point) are allowed to return to their stable states. This stress, when released, produces a reaction. Stress in 2D energy fields due to strain of quanta of matter, stored in the displaced lattice-work-structure of quanta of matter in the matter field, is the 'energy' stored in a macro body.

$$\text{Energy} = \text{Force} \times \text{distance} = (\text{Work} \div \text{distance}) \times \text{distance} = \text{Work}$$

Energy is a functional entity, which signifies the strain and associated stress in a macro body's matter field. It has no physical existence. It indicates yearning of quanta of matter to return to their stable states (relative position and size). Energy is the result of relative displacements of quanta of matter in a matter field's lattice-work structure. Magnitude of stress, developed in a 2D energy field, is proportional to displacements of quanta of matter in their lattice-work structure. Relative displacements of quanta of matter are work-done. Magnitude of stress in a matter field is directly proportional to average displacement of quanta of matter in the matter field. Hence, work-done about a macro body and energy stored in it can be considered as numerically equal (depending upon the measurement system used). Magnitude of work-done during an action is equal to change in the magnitude of energy-stored in the body's matter field. Normally, magnitudes of work-done about a macro body and energy-stored about it are considered to be same and their names are interchangeable. Energy of a body is defined as the amount of work, the body can do (by using its energy).

Work:

Displacements of quanta of matter in the lattice-work structure of 2D energy fields are too small to be measured by three-dimensional spatial measuring systems. Actions of gravitation and field forces are generally noticed by inertial motions of concerned 3D matter bodies in space. Therefore, magnitude of gravitational attraction or field force is always measured in comparison with an inertial effort that makes equivalent inertial action on a 3D matter body. Thus, all classes of efforts came to be measured by the same dimensional-measurements system.

Due to different locations of quanta of matter in a matter field, directions of quanta of matter's deflections during investment of additional distortions (work) in a matter field vary. Magnitude and direction of distortions will be different at different locations in the lattice-work structure. Hence, work associated with a macro body, has no particular direction. Work is a scalar quantity. It has only its magnitude as tangible measurement. Inertial motion or displacement of a macro body in space due to work-done (additional distortions invested into its matter field) has definite direction as well as magnitude. Magnitude of work about a matter body is the total magnitude of distortions in the body's matter field. It includes two components.

First component is constituted by magnitudes of work required for creation and sustenance of body's constituent basic 3D matter particles and magnitudes of work required for development and sustenance of body's fundamental particles, atoms, molecules and the integrated body itself. This constitutes a component of work that is intrinsic with the matter body as long as it exists. A change in this work necessitates either partial or full disintegration or additional development of the macro body.

A basic 3D matter particle (photon) has its highest matter and energy contents, when it is free space. All photons, which are suitable for creation of superior matter particles, have identical magnitudes of matter and energy contents. However, on each step of development of superior matter particles, by these photons, certain portions of their matter and energy contents are lost due to 'packing fraction' required for such development. Hence, intrinsic energy, associated with a macro body, depends on a macro body's total matter content and distortion-density of surrounding 2D energy field. In free space a macro body will have its highest matter and energy contents. The macro body will be in its coolest state.

Second component of work about a macro body is constituted by additional distortions in its matter field, which are required for macro body's whole-body motions. Consequence of this component of work in the macro body's matter field is exhibited in various forms of its states or body-motions. Work or energy required for each type of motion, the macro body possesses, may be accounted separately. Although they are latent in the total additional work in macro body's matter field, they maintain their

independence under all conditions. Additional works for linear motion, angular motion, kinetic energy, potential energy, state of heat, etc. are different variations of additional work in a matter field.

Force:

Stable state of motion of a macro body in space is its motion at a constant linear (and angular) velocity. Action of an external effort may bring about a change in the magnitude of its linear speed or direction of its motion. Rate of change of linear velocity is macro body's acceleration. Hence, linear acceleration of a macro body is proportional to external effort acting on it (the rate of distortion-transfer). Change in the state of (motion of) a macro body is directly related to magnitude of additional distortions, being stored or removed from in its matter field. Force is the magnitude of rate of change of additional distortions transferred (work-done) into or out of the matter field of a macro body.

$$\text{Work-done} = \text{change of momentum}$$

$$\text{Force} = \text{rate of change of momentum} = \text{Rate of work-done}$$

All matter bodies essentially contain matter. Consequently, a body also needs to be defined by its matter content. For this, due to lack of an absolute reference, we have no direct dimensional measurement system for matter content of a body. In order to overcome this difficulty, we have to depend on the fundamental spatial dimensions to provide us an indirect reference to develop a dimensional measurement system to measure matter content of a body. By defining a functional entity 'time', we are able to relate displacement of a matter body in space to time. Terms 'velocity' and 'acceleration' are results of these relations. Linear acceleration of a static macro body is proportional to action of an external effort on it. This gives us a constancy of proportion between the external effort, acting on a (relatively) static macro body and the body's linear acceleration in the direction of external effort. This constant of proportion is the magnitude of resistance offered to change in the state of body's motion. This is taken to be a measure that represents the matter content of the macro body, called the mass of the body.

$$\text{Force} = \text{Mass} \times \text{Acceleration} \quad \text{or} \quad F = m a$$

Generally, we use the above equation to define both, mass of a macro body and magnitude of external force on it. Lack of an absolute reference to define matter content of a body necessitates use of this circular logic, essential. Development of aberrations, like relativistic mass, etc. are result of this circular logic.

Similar relations are also defined for rotational motions of a macro body. Terms; torque, moment of inertia and angular displacement / speed / acceleration replace terms; force, mass and linear displacement / speed / acceleration in these relations.

$$\text{Torque} = \text{Force} \times \text{perpendicular distance between direction of force and centre of rotation}$$

$$\text{Torque} = \text{Moment of Inertia} \times \text{Angular acceleration}$$

During action of an effort, additional work is being stored in the matter field of a macro body and the macro body accelerates in proportion to the rate of transfer of additional work into its matter field. That is, the macro body increases rate of its displacement in space. Once the external effort ceases to act, the macro body continues to move at a constant linear velocity proportional to magnitude of total additional work, invested in its matter field. In both cases, there are no changes in the constitution of matter particles of the macro body, other than their displacements in space.

In order to remove additional work, stored in macro body's matter field, another external effort is necessary to act on the macro body in opposite direction. Additional work, introduced into matter field of the macro body in opposite direction by this external effort, nullifies additional work, producing inertial effects of original effort. Thus, the opposite external effort decelerates the macro body to reduce its inertial effects.

Inertia:

It is noticed that every body is reluctant to change its state of motion. This phenomenon is called 'inertia'. Lattice-work structure of 2D energy fields (universal medium) is the cause of inertia. Mechanical property of lattice-work structure gives rise to delays in stabilisations on distortions in its structure and constant transfer-speed of distortions in it.

Inertia is a passive property. It can only oppose efforts (forces or torques) by active agents. A matter body keeps its constant state of motion not because of its inertia but only because of the

absence of an effort to change its state of motion. 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. Hence it is not quantified. However, resistance offered to a change in a body's state of motion may be quantified in terms of external effort on the body and change in its state of motion. Magnitude of this resistance may be understood as equivalent (not equal) to inertia associated with a body. There are two types of numerical measures of resistance (inertia) of a body to changes in its state of motion.

Its 'mass' governs body's resistance (inertia) to the action of an external effort (force); in a direction through centre of body's matter content. Since magnitude of this resistance is proportional to magnitude of matter, the body contains, mass of a body is generally understood to represent magnitude of body's matter content.

$$\text{Mass} = \text{Force} \div \text{acceleration}$$

Its 'moment of inertia' about a specified axis measures body's resistance (inertia) to the action of an external effort (torque) about the same axis. Magnitude of moment of inertia depends not only on the matter content of a body but also on parameters of axis chosen. For the same body, depending on the axis chosen, different magnitudes of resistance (inertia) may be exhibited. Moment of inertia of a body is determined mathematically, considering mass distribution and shape of the body.

Conclusion:

Force, being a rate of work-done on a macro body, is a functional entity. Work-done on a macro body is a real entity and it is the magnitude of total additional distortions introduced into or removed from matter field of a macro body by external effort. Efforts act through an all encompassing medium, called 2D energy fields. State of (motion of) a macro body is determined by total magnitude of additional distortions (work) in its matter field. Unstable additional distortions, present in the matter field of a macro body during change of body's state of motion, are the acceleration component of the external effort. Time required for stabilization of additional distortions, within the matter field of a macro body, gives rise to the phenomenon of inertial delay. Additional distortions, in the matter field of a macro body in their stable state, maintain steady state (of motion) of a macro body. Action of an effort is simple mechanical rearrangements of quanta of matter in the universal medium about a macro body.

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