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Article I: The Reality of Newton's Inertia

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Introduction

Isaac Newton made the classical mechanics concept of inertia the widely recognized physical concept it is today. But we have discovered, while using Newton's definition and descriptions of inertia during an event, inertia turns out to have the role of nothing. After much research and comparison with events, we strongly suspect that Newton's inertia is not anything real in nature. The purpose of Article I is to apply modern day logic and understanding to inertia, one of the oldest cornerstones of the science of physics.

Article I

In his monumental work, "Mathematical Principles of Natural Philosophy", known today more simply as "PRINCIPIA" [1], Isaac Newton described inertia as the "force of inactivity". He went on to write that an object maintained its state of rest, or uniform motion (same state) "by its inertia only." In other words "resting" and "uniformly moving" objects were viewed by Newton as being equally inactive and further that this inactivity was being maintained by a force Newton called "inertia". Thus, according to Newton's description, the object's "force of inertia" must serve in some manner to prevent activity from occurring to the object's state of motion if the object's "inactivity" is to be "maintained". With rest and uniform motion being the inactive state then a change in motion, known as acceleration, must be the active state that challenges the inactivity-maintaining power of the object's "inertia". Since the activity of acceleration is always caused by an accelerative force (Newton's LAW I), and further since every accelerative force always finds support against some other force of equal magnitude (Newton's LAW III), then possibly Newton's inertia could be this other force that reacts in support of the accelerative force which is busy acting as the cause of the object's acceleration. (See references [2], [3], [4] & [5]).

(2) If so, why did Newton refer to inertia as being a "force of inactivity"? Clearly, any force that reacts in support of an acceleration-causing action force is itself a force that is a participant in the activity of acceleration. For certain, as long as the active acceleration force is present, the object will continue to accelerate with no end in sight. Therefore, in practice, any reactive inertia force directed back from the object does nothing to prevent the acceleration/action force from continuing to cause acceleration for the object. In fact, as long as the acceleration/Action force is impressed against the accelerating object, no force of any type is present that is successful in causing an end to the acceleration and thereby restoring the object once again to the non-accelerative inactive state viewable as rest or uniform motion as Newton predicts is the true role of the object's inertia. It appears to us that during an accelerational event, there is no evidence

of the presence of any "force of inactivity" that matches Isaac Newton's description for the role of inertia.

(3) Continuing our effort to discover and understand the reality of Newton's inertia, we imagine an experiment that is located in the vacuum of space at the balance point between Earth and the Moon. Here a weightless billiard ball is positioned within arm's reach in front of an astronaut. If Newton's inertia is busy maintaining this ball's inactive state of motion, then how can it be that even the slightest push from the tip of a feather will immediately cause the ball to abandon its current state of motion for a new one? This experiment shows that there is nothing present that prevents the ball from accelerating away from the astronaut's location in response to the miniscule force applied by the feather's tip. While it takes an action force to accelerate the ball in one direction and an oppositely-directed action force to accelerate the ball in the opposite direction, in the absence of either of these acceleration/action forces, there is no force present at all, nor anything else, that is busy "maintaining" the ball's inactive state of motion. From the astronaut's perspective, prior to being pushed, the ball before him is in the inactive, non-accelerative, state of rest.

(4) Since it takes the presence of an action force to cause the billiard ball to accelerate away from its position of inactive rest in front of the astronaut, as described in Newton's LAW I, in the absence of such an action force, what should one expect the ball to do in the meantime? Does the inactive ball not have but one available option? That solitary option is for the ball to continue waiting in the inactive state of rest until the next acceleration/action force becomes present. If he were asked to consider this event, Isaac Newton would likely point to the inactive billiard ball and contend that the presence of the ball's inertia was the reason the ball's inactive state of motion was being "maintained". We would counter that according to his own, perfectly correct LAW I, since it takes an action force to cause acceleration for the ball, the true reason the billiard ball remains in its inactive, non-accelerative, state of motion is due, not to his claim of the presence of the ball's inertia but instead, more simply, to the absence of an acceleration-causing action force, as correctly predicted by Newton's own LAW I.

(5) According to Law 1, the presence of an action force is required to cause acceleration for the billiard ball. Even Newton would likely have agreed that in the absence of such an acceleration-causing action force, the billiard ball has no other option but to remain in its current inactive state of rest-motion until such time as the next action force becomes present. At this point it is clear to us that the only condition required for a resting object to continue resting indefinitely, is for all action forces to be either absent or in balance with each other. We conclude that Newton's inertia again has no role to fill regardless of whether the object's state of motion is active, as when an acceleration/Action force is present, or inactive as when an acceleration/Action force is absent. Again the role of Isaac Newton's inertia is the role of nothing.

(6) What then do today's educators teach us about inertia? Drawing directly from Newton's DEFINITION III [5], inertia is generally said to be an innate property of matter whereby the matter's inertia property endeavors to preserve the matter's inactive state of rest or inactive state of uniform motion (same state) by resisting any force attempting to cause a change in the matter's motion. The word "resist" as interchangeable with "oppose" and the phrase "change in the

matter's motion" as interchangeable with "acceleration". Substituting these clearer words, we now have matter's innate property of inertia opposing any force causing acceleration for the matter. Since acceleration can only be caused by an action force (Newton's LAW I) and since any such acceleration/Action force is always opposed or supported by an equal force (Newton's LAW III), this means that in order for the matter's inertia to present opposition to the acceleration/Action force, it must itself be a force, measurable inpound.force (lb.f) or the Newton (N).

(7) These considerations present even more problems for inertia which as an unchanging property of matter is today professed to not be a force at all, and not measurable in any distinct units of measure for inertia, certainly not in lb.f. or the Newton. Furthermore, the acceleration force applied by the feather against the weightless billiard ball in space is said to be the only force experienced by the ball's matter. Thus it is professed in modern physics that the acceleration force from the feather is a "net force" or "single force" or "overall force" or "unbalanced force" that is predicted to act upon the ball in the complete absence of an equal and opposite force affecting the ball's matter. In support of this "net force" position we are asked to consider that no force is pushing back on the other side of the ball. Yet what of Newton's LAW III that predicts, without exception, every force is always opposed or supported by an equal force?

(8) When the billiard ball is accelerating in one direction caused by the acceleration/Action force from the feather, we theorize the ball's matter is also experiencing an equal force of support in the opposite direction. Newton's LAW III tells us to expect this to be true. We see the bending aside of the feather's tip as a visual indication of the presence of equal and opposite forces, one of which is a backward reaction force that is being generated deep within each component of the matter of the accelerating ball. Why deep within each component of the ball's matter? If a single component of matter is removed from the ball and an identical acceleration/Action force is applied to the ball, the result will be a slight increase in the ball's rate of acceleration. Just as the acceleration/Action force has an individual effect on each component of the ball's accelerating matter, any acceleration/Reaction force of support is sourced individually from each same accelerating component of the ball's matter.

(9) The backward reaction force from the accelerating billiard ball that is presented against the feather's tip currently holds a discounted role during this event. The widely accepted Action/Reaction Force Rule defines each force of an action/reaction pair of forces as affecting a different object and therefore neither force is accepted as acting or reacting to cancel or provide support for the effect the other force has upon one of the objects. Based upon this rule, supporters currently ignore the backward reaction force from the billiard ball because they only accept that it is affecting the feather. Hopefully they do not think that this reaction force just suddenly appears at the contact point between the ball and the feather. This could lead students to think that there is but one force being experienced by the ball, with this force being the forward acceleration/Action force from the feather. Using this logic, it is easy to conclude that the ball is experiencing a forward-directed "net force" or "unbalanced force" from the feather especially since, in this frictionless environment, it is not recognized that any rearward-directed force is acting or reacting within the matter of the accelerating ball.

(10) Is this popular "net force" or "unbalanced force" position, regarding the forces affecting the ball, actually correct? In this next experiment, the astronaut will use a different billiard ball that has been previously sliced in half with the flat surface of each half attached to the opposing ends of a short, large diameter, open-coil compression spring. Setting the feather aside, the astronaut will apply a somewhat greater forward-directed acceleration/Action force using his or her glove pressed against the middle of the curved part of the back half of the ball causing forward-directed acceleration for the back half. This back half will subsequently apply a forward-directed acceleration/Action force being transferred by the compression spring to the front half of the ball causing forward-directed acceleration for the front half. Now, according to Newton's LAW III, (neglecting the matter of the spring) as much as the back half is pushing forward with an action force on the ball's front half, the front half is pushing rearward with a reaction force on the ball's back half. Here we have established the presence of a rearward-directed reaction force upon the back half of the accelerating ball, as experimentally validated by the visual reduction in the length of the compression spring between the ball's two halves. If the front half of the ball is also sliced in half in a direction parallel to the first slice and another (weaker) compression spring is inserted, another rearward reaction force on another portion of the ball's matter is also established as being present, and so on until the forward-most atom of the ball's matter is reached. Even here, as much as the forward-most atom is accelerated forward by the last of the push of the acceleration/Action force from the astronaut's glove, the atom pushes rearward with its own equal and opposite acceleration/Reaction force. Thus there is no point within the accelerating billiard ball where the remaining portions of the forward-directed action force from his/her glove are not equally opposed by the acceleration/reaction forces being transferred rearward from the remaining portions of the ball's accelerating matter. Slicing the ball just helps us to see this truth. Accordingly, we now recognize that the "net force" conclusion regarding the predicted absence of any rearward-directed forces experienced by any portion of the ball's matter is a conclusion without merit. The same may be said for the Action/Reaction Force Rule (see Article IV) for it truly is a misleading and thereforemeritless rule. We think its continued use is a hindrance to correctly understand the true acceleration/action and acceleration/reaction forces present during an object's acceleration.

(11) Regarding Newton's inertia, at this point in our investigation, no role has been found. How would Albert Einstein deal with Newton's failure to convince us of inertia's existence? To paraphrase Einstein's remark on ridding science of the imaginary concept of"aether", 'If inertia has no effect or purpose then it can be discarded with no loss.'

(12) It has been our experience that every event involving the inactivity of rest-motion or the activity of acceleration can be fully and accurately described without any need to mention Newton's "inertia". With "inertia" finally gone, one may wonder if this dethroning will uncover a here-to-fore hidden or neglected concept for force. We think just such a concept has risen from "inertia's" ashes. This "new" concept is the acceleration/Reaction support force that is generated within every accelerating object's components of matter. We refer to the a/R force and an internal force since it is generated internally with each component of every accelerating object's matter.

(13) Let us return to our billiard ball in space event. With his glove, the astronaut is again applying an acceleration/Action force against the billiard ball at rest before him. The ball

immediately begins accelerating away from his position while reactively applying a mutual acceleration/Reaction force back against his glove. The moment he stops causing the acceleration/Action force against the ball is the moment the ball's acceleration ceases and also the moment the acceleration/Reaction force stops being reactively applied back against his hand. We think the truth is that his glove's acceleration/Action force causes both the ball's acceleration and the reactive generation of the ball's mutual acceleration/Reaction force. This acceleration/Reaction force does nothing to "resist" or prevent acceleration from occurring nor is it the cause of any event.

(14) Since the acceleration/Reaction support force is caused by the acceleration/Action force it cannot be expected to cancel its own a/A force cause. Instead, the a/R force provides ongoing and variable mutual support for its acceleration/Action force cause. It can never be expected to exist after its a/A force cause becomes absent. These two, mutual, action/reaction, a/A and a/R forces are inseparable. Finally, we recognize that the acceleration/Reaction force is incapable of "acting" as the cause of any event, even one as benign as "maintaining inactivity". In summary, the acceleration/Reaction force is always directed opposite to the direction of the event's accelerational activity while it provides LAW III required mutual support for thethe event's acceleration/Action force cause.

Conclusion

(15) Isaac Newton's "force of inertia", though inaccurately and misleadingly defined, does signify an early recognition of the common, acceleration/Reaction force we recognize today as being present in every accelerational event whether it be linear acceleration or centripetal acceleration. The acceleration/Reaction force in linear events is always directed opposite to the direction of the acceleration and opposite to the event's acceleration/Action force cause. Likewise, the acceleration/Reaction force in circular events, known commonly and correctly as centrifugal force, is also directed opposite to both the inward directed centripetal acceleration and to the event's inward directed centripetal acceleration/Action force cause. Newton's "inertia" is not anything real in nature. To finally set "inertia" aside is an advancement in our understanding of natural events.

We hope to have correctly and thoroughly set the stage for the proper recognition and rightful placement of the internal acceleration/Reaction support force of matter.

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References

[1] Sir Isaac Newton, 1686, 1729, Mathematical Principles of Natural Philosophy and His System of the World, 1934, 1962, PRINCIPIA, University of California Press, Berkeley, Los Angeles, London, page 2 - 13.
[2] Newton's LAW I: Every body continues in its state of rest, or of uniform motion in a right line, unless it is compelled to change that state by forces impressed upon it.

[3] Newton's LAW III: To every action there is always opposed an equal reaction: or, the mutual actions of two bodies upon each other are always equal, and directed to contrary parts.
[4] For a body maintains every new state it acquires by its inertia only.
[5] Newton's Definition III: The vis insita, or innate force of matter is a power of resisting, by which every body, as much as in it lies, endeavors to preserve in its present state, whether it be of rest, or of moving uniformly forward in a straight line.

Author's Commentary

Hopefully Article I will shift the focus away from our never-ending attempts to understand and explain Newton's imaginary concept of "inertia". Instead we are free to embrace and understand the common everyday acceleration/Reaction force of matter. This internal reaction force is present throughout the matter of an active accelerating object, and absent at all times of inactivity when the object is in rest-motion where acceleration is absent.

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