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Question 1: How is acceleration caused if not by an unbalanced force?

Ethan:

I just came from another physics site that discussed Newton's laws. They say his 1st law states that an object's acceleration is due to an unbalanced force. Are you saying here that there is no such thing as an unbalanced force? How do you think an object can possibly accelerate if it is not being pushed in some direction by an unbalanced force? I'll go with Newton on this one. W. J. Lincoln City, OR, USA

Hello W.J.:

I'll go with Newton too. But that will still leave the "net" force theory a theory without merit. Let me explain. Newton never did write anything about acceleration being caused by an "unbalanced force" or a "net force". Quite the contrary is true for Newton fully understood how equal and opposite forces always pair off during any event, accelerative or non-accelerative. The official text of Isaac Newton's LAW I, from PRINCIPIA and as referenced in Article I herein, confirms my position for it reads as follows:

"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."

Do you see anything in LAW I that even hints that the acceleration/Action force impressed upon the object is an "unbalanced force" or a "net force"? Notice that this translation from Latin to English uses the plural form "by forces impressed upon it." to represent the acceleration/Action forces present. If he had wanted us to think in "net force" terms, then Newton's Latin words would have translated into a singular form such as "by an unopposed force impressed upon it", would they not? But then if Newton had thought that an "unbalanced" force could exist unopposed then he would have had to consider his own LAW III to be in error along with his basic understanding of how the pressure between two contacting objects always remains "mutual", as in equal in magnitude and opposite in direction.

The truth is that Newton fully recognized whenever an acceleration/Action force is impressed against or within an object, an equal and opposite acceleration/Reaction force is always present. He made this position very clear in his LAW III regarding the equality of mutual forces. 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.

The correctness of Newton's LAW III is especially easy to recognize when one considers the event of an object being accelerated by an external contact force. Suppose the object is a warm, smooth marble flagstone that you place on the ice at a skating arena and then proceed to accelerate the stone along the ice with a sudden push from one finger of your hand. You are providing the acceleration/Action force, are you not? Do you not recognize the mutuality of the forces present at the point where your finger contacts the stone? Is not the stone pushing back exactly as hard on your finger as the force with which you are pushing forward on the stone? Of course it is. These "mutual forces" are an action/reaction pair of forces with one acting as the

cause of the stone's acceleration, and the other reacting to the cause of the stone's acceleration. By what process is the stone able to push back against the accelerative force from your finger? By its internal acceleration/Reaction force that is present within the stone's matter only during the stone's acceleration and is reacting in the opposite direction in support of the acceleration/Action force of your push. No matter how hard or how soft you push against the stone, the acceleration-causing portion of the force of your push against the stone is precisely matched by the stone's supporting a/R force, for these two opposing forces are interdependent "mutual forces" responsible for the "mutual pressures" between your finger and the stone.

What happens when you stop accelerating the stone in its forward direction? Well, the friction forces with the ice below begin accelerating the stone in the rearward direction with the same type of external (contact) force as the external (contact) force from your finger. While some of the Physics books I read refer to this portion of the event as representing a fine example of a frictional "net force", the authors arrive at this indefensible position because they do not recognize nor understand an object's acceleration/Reaction force. In the stone's case, since it is now experiencing a gentle frictional acceleration/Action force directed toward the rear which is slowing its forward progress along the ice, it reacts with gentle equal and opposite a/R forces from within its own matter directed toward the front that vary precisely in sync with the varying frictional a/A forces received from its contact with the ice. In both cases of acceleration, the stone's a/R forces are reacting against the acceleration/Action force, first from the forward push of your finger and second from the rearward push of the stone's friction with the ice. In each case the stone's a/R forces exactly match the acceleration/Action forces present. In each case the stone's a/R forces do nothing to reduce or cancel the acceleration/Action force for that action force represent their cause. After all, when you push against a wall, does the push back from the wall do anything to reduce or cancel your push? No, instead, as long as you push against the wall, it will push back with an equal force, for the non-acceleration/Action force of your push represents the cause of the non-acceleration/Reaction force of the wall's push.

But even though it can be shown that no force exists without the presence of an opposing force of equal magnitude, "net force" proponents will still contend that a "net force" is possible. How? Well, when you accelerate the warm marble stone in a near frictionless manner along the ice, despite there being equal and opposite forces present between your finger and the stone during acceleration, these proponents ignore the rearward force from the stone against your finger and claim instead that the substantial forward-directed acceleration/Action force from your finger is a "net force" being experienced by the stone since, other than a negligible amount of friction, they do not recognize any other substantial rearward-directed force being present that is acting or reacting against the stone's matter. In other words, in their limited view, the stone is accelerating because you are pushing forward on the stone while at the same time no force is thought to be pushing rearward on any portion of the stone. Thus they conclude that your forward push is an unopposed "net force" that is the cause of the stone's acceleration. (See Article V: The Mutual Force Rule)

For their position to be true, there must indeed be no rearward-directed force, other than negligible friction, that is impressed against any portion of the stone. Now suppose I cut the marble stone in half and then accelerate both halves by pushing against the first half while this first

half pushes against and thereby accelerates the second half. Since all agree that the contact forces between these two halves are mutual during acceleration, then as much as the first half is exerting a forward-directed force against the second half, the second half is exerting a rearward-directed force against the first half. By this logic, all must also agree that this substantial rearward-directed force does indeed exist against the first half of the stone during acceleration which totally and completely refutes the claim of the "net force" proponents that no substantial rearward-directed force exists against any portion of the stone. One can continue dividing the forward half of the stone into smaller and smaller pieces with each such division revealing a reduced rearward force against the balance of the accelerating stone. When all of these rearward-directed a/R forces, being generated within each component of the matter of the accelerating marble stone, are added to the negligible amount of rearward force of friction, the total rearward-directed force will exactly equal the forward-directed force of my push. The rearward-directed a/R forces reach their maximum at the contact point between my finger and the stone. So while "net force" proponents recognize this rearward force as being present at this external contact point, they do not recognize it as being present to a lesser degree deep within the stone's matter nor do they understand the role this rearward-directed a/R force has in providing the necessary equal and opposite reaction force so that the action force of my a/A push against the stone can even exist. In Article III we learn that one simply cannot push against an object that does not push back with an equal force in response. Thus if it were not for the existence of the stone's variable a/R force, I could not push forward against the stone with any more force than the stone's negligible rearward-directed force that is caused by friction between the stone and the ice and air. In the end it is clear that the proponents of the "net force" theory of acceleration are ignoring the often substantial rearward-directed or outward-directed acceleration/Reaction forces that are present during every event involving the acceleration of matter. Accordingly, the "net force" theory regarding the acceleration of matter is a bankrupt theory. In Article IV, we learn the truth, that acceleration is caused by differences in the types of opposing forces that are present, not by differences in the magnitudes of opposing forces that are present. In Article V we learn that the limits imposed by the mutual force rule are false in that action forces never "get past" reaction forces to affect an object in an unopposed or "net force" manner. Instead, action and reaction forces affect not only different objects, as predicted by this false "rule" but they also routinely affect the same object as well indicating that this often used "rule" deserves abandonment.

By now, it should be clear that Newton's work does not support the "net force" theory of acceleration. Instead his work correctly predicts that every force present during every event is always directly opposed by an equal force, of one type or another, that is immediately present, leaving no force left "unbalanced" (See the Universal Law of Mutual Forces in Article III). To change the wording of Newton's LAW I to include a reference to the supposed existence of an "unbalanced" or "net" force is to drastically alter Newton's LAW I putting it in direct conflict with LAW III.

The bottom line, W.J., is that when one modifies Newton's work, one should at least have enough respect for Newton to identify and personally bear the responsibility for any changes made to his work. Since this notification of true authorship to the reader is usually not made, whenever we are told that Newton "stated" something, or that Newton "meant" something, we need to recognize that someone else is attaching their own understandings or misunderstandings,

as the case may be, to Newton's work. Just as only a few have shared in Newton's understandings before his time, only a few have shared in his understandings since his time. Judging from the popularity of today's illogical "net force" theory of acceleration, it is sadly clear that those few of his caliber who have lived since Newton's time have not taken to authoring books on Physics.

Thank you, W.J., for a most excellent question.

Ethan Skyler