Revising The Newton's Laws of Motion

Le Tat Dieu

"I've found that while many people are seeking ever more complex solutions to ever more abstract issues, a lot of the basics are ignored."
John B Merryman

WHAT CREATES INERTIA?

While revisiting Newton laws of motion, especially the First one –*"When viewed in an inertial reference frame, an object either remains at rest or continues to move at a constant velocity, unless acted upon by an external force "(W)* – I was bothered by this question:

What makes objects REMAIN AT REST? And how is it done? Or more specific: What creates Inertia, the resistance force of any physical object to any change in its state of motion?

In searching for the answer, I traced back to Inertia's original source, step by step. And here's what I found:

1-That no evidence, proof or sign indicating that inertial power comes from inside or is created by the objects themselves. It is definitely generated from a source outside the object.

2-That two masses built with the same material have the inertial power that varies by size. The bigger (heavier) has more inertial power than the smaller (lighter).

3- That **Gravity** causes an object's weight, dictating the amount of inertial power assigned to that object.

Therefore, Inertia, the force that keeps objects at rest – or creates resistance to any change in their state of motion – is Gravity.

Just watch a person trying to pick up or push a steel ball being at rest on the ground. While pushing or lifting that ball, he is working against the gravity that ties it down to the surface of the Earth. Actually, the objects at rest are constantly

affected by local gravity that generates its inertial power. To successfully lift the ball up, he needs a force stronger than gravity's (to overcome the ball's inertia.)

So, how about the space in which gravity is zero?

Here, gravity is replaced by ***the pressure of Dark Matter***. Surrounded by Dark Matter that applies pressure equally on its entire body, the object cannot move to any direction and stays still – relatively to the local space frame – unless affected upon by an external force. Similar physics' law applies to floating objects in mid water or liquids whose pressure is equal or stronger than Earth's gravity.

Since Einstein discovered – without knowing it – that Dark Matter creates Gravity, it will be simpler to say:

Dark Matter, or the trampoline of the Universe, produces Inertia for all the physical objects.

The Inertia isn't always identical with the weight. Only when you lift an object up, then you need a force stronger than gravity's – to overcome the object's inertia that equals its weight. Otherwise, if you push or pull it, its inertia could be more or less, depending on the size and shape of the contact area between the object and the ground. If it's as small as a point (pointy object), its inertial power would be very weak, and with a little force, you can knock it down. But if it's flat and large, the inertial power – as well as the required pushing force – will be: its weight plus friction's resistant force. Counting friction as part of the object's inertia or external force acting upon it doesn't change the dynamic of this situation.

See the Newton's (re-written) Third Law covering the Inertia's variety in many situations below for more details.)

RE-WRITING THE THIRD LAW

Thoroughly re-examining this Newton's Law, I found its formulas and arithmetic are flawless, but Newton's statements and explanation for its establishment are far from perfect.

The Third Law, for example, says: "*When one body exerts a force on a second body, the second body simultaneously exerts a force equal in magnitude and opposite in direction on the first body.*" Or: *"To every action there is always an opposed equal reaction: or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts."* (Translated from Newton's original version – Wikipedia.)

And here are some explanations:

1. Newton's own version:

"Whatever draws or presses another is as much drawn or pressed by that other. If you press a stone with your finger, the finger is also pressed by the stone. If a horse draws a stone tied to a rope, the horse (if I may so say) will be equally drawn back towards the stone: for the distended rope, by the same endeavour to relax or unbend itself, will draw the horse as much towards the stone, as it does the stone towards the horse, and will obstruct the progress of the one as much as it advances that of the other. If a body impinges upon another, and by its force changes the motion of the other, that body also (because of the equality of the mutual pressure) will undergo an equal change, in its own motion, toward the contrary part..." (W)

2. A simpler and more popular version:

"From a conceptual standpoint, Newton's third law is seen when a person walks: they push against the floor, and the floor pushes against the person. Similarly, the tires of a car push against the road while the road pushes back on the tires—the tires and road simultaneously push against each other." (W)

I found Newton's statement "*...that If a horse draws a stone tied to a rope, the horse ... will be equally drawn back towards the stone: for the distended rope... will draw the horse as much towards the stone, as it does the stone towards the horse...*" vague and misguided.

The horse actually generates a drawing force. The stone doesn't. Being at rest on the ground, it uses its inertia (weight created by the local gravity) to resist any change in its state of immobility. The horse can move forthward and backward, change its pace, or totally stop its action. The stone has no such an active role. The verbs such as: "push, pull" or "draw" are inappropriate for an object using only its inertia to react.

Saying that "*the horse ... will be equally drawn back towards the stone"* is also inaccurate. While trying to pull the stone, the horse is struggling with the gravity force applied on the stone. If the horse generates a power greater than the stone's inertia, it would feel a resistant power much weaker than its initial drawing force that successfully moves the stone. So the words *"equal force, equal power"* cannot be used for many circumstances. Neither does the ruling of Newton's Third Law.

The explanation about "*walking man"* and "*running car*" in the popular version is no better.

"*When a person walks: they push against the floor, and the floor pushes against the person", "the tires of a car push against the road while the road pushes back on the tires"*... These statements are poorly describing and wrongly interpreting the important elements in the physical process of the "man walking and car running" events.

When you walk (or run) you're working against gravity, forcefully overcoming its power, pushing yourself forward. Your feet continuously press on the floor that now becomes their fulcrum (point d'appui). The floor does not push back. Like a mirror, it only reflects the pressing force of your feet. Then your feet's reflecting force will push your body up and forward.

Similarly, while the car's engine generates a force much stronger than gravity's, powering the car forward, its tires are constantly pressing the road (now serving as a giant fulcrum) grinding themselves against every "point d'appui" they were encountering for assisting to free the car from the *gravity* and the *friction*'s resistant power.

Revising the language of Newton's Laws is more important than rewriting the explanation.

We have to examine several scenarios before reaching any valuable conclusion.

1-Mr. (Heavy weight Fighter) HW1 and Mr. HW2 (assumed having perfect match of size, weight, and power) are pushing against each other. They both would meet an equal resistant force as dictated by the Third Law.

2-If a Mr. (Light weight) LW tries to push against Mr. HW who holds his ground, refusing to budge; LW also feels a resistant force as powerful as his original pushing force. The same result happens when one tries to push a solid brick wall.

3-But when Mr. HW pushes against Mr. LW, he receives not all but only a big portion of his pushing force reflecting back. The rest is absorbed by Mr. LW's retreating or falling back motion. The mutual actions of two bodies upon each other are definitely not having equal power in this situation.

4-The same phenomenon of decreasing the resistant force happens when a steel ball hit an aluminum ball, unless the latter is bigger and heavier. And you can punch through a mass of jello without meeting a significant resisting force. That's why a stunt man can walk away without a scratch after falling from the top of a building and landing on a huge pile of empty cardboard boxes. And cars have airbags.

So the material that makes the object matters, and needs to be considered. We are talking about the law of physics that applies to every physical object in the Universe here.

Therefore in scenario #3 and #4, Newton's Third Law is overruled.

Knowing all that, we should re-examine Newton's Laws of motion and revise it accordingly. For example, the First should consist of the original source of Inertia and the Third should be: *"To every action there is always an opposed reaction whose reacting power varies by shape, size, weight, inertia and "made-of" material of both parties."*

But I think the word "reflection" is much more appropriate than "re-action".

Redo the test that shows force can be transferred from one object to the other, and observe:

Line up five balls next to each other pendulum's style. When ball#1 swings and hits ball#2, balls number #2, #3, and #4 won't budge. Only ball#5 would bounce up and come back down, hitting ball#4. Again, #4, #3, and #2 won't budge; only #1 will bounce up and come back down. So the hitting force of ball#1 DOES NOT meet ball#2's immediate (and equal) reaction upon impact. Instead, it travels through #2, #3, #4, and pushes #5. Then ball#1 has to wait for the reflecting force

from ball#5 traveling back through the same path before reaching it. No (equal) re-action, only (weaker) reflection.

So, to be precise, the 3rd Law should read: "*When one body exerts a force on a second body, the second body **reflects** it back with a reaction power that varies by its kinetic (if any), shape, size, weight, inertia, and "made-of" material of both parties."*

SWALLOWING A DEFECTED PRODUCT

Physicist Robert E. Salvino's story about his students' reaction when first encountering Newton's Third Law touched me and inspired me to keep on fighting for the truth.

He wrote: "*During 1st and 2nd years of graduate school, grad students were required to spend a few hours per week in a large conference room to supply tutorial help for undergraduate students... the biggest issue by far was Newton's 3rd law. The most common question was "If the force and reaction force are equal and opposite, then how can there be any motion if the net force is always zero?"*

Dr. Salvino's story has a very happy ending: *"When I asked these students (second group) to push on something like a chair, I then said "I noticed the chair moved: what happened?" The students replied "Oh come on, I pushed on it, I supplied the force to make it move." Then I said "I also noticed your hand kicked back when you pushed on the chair. What made that happen?" The students would reply "Well, the chair pushed back on my hand and ... oh, okay, now I really get it." Again, the eyes widen and the smile appears with the statement,"* he wrote.

Poor kids! They either faked their "*really get it*", or deceived themselves into fathoming the physical impossibility, to avoid looking like a dim-witted student who lacks the intelligence to understand the sophistication of physics.

This legitimate question, and many others that came from the students, shouldn't be ignored. And "feeling the resistant power while pushing the chair" has never been a good enough answer (No doubt that "actions ask for re-actions" but always with EQUAL re-acting force?)

The students do not only think intuitively, but also base their judgments on the knowledge and experiences that three hundred years ago, Newton never had. They

have known about the life saving function of airbags, witnessed stuntmen safely landing on a huge pile of empty cardboard boxes after falling from the top of a building. Many had seen with their own eyes the event at the junkyard in which old cars being pressed into metal blocks without any chance to fight back the oppressing force with "equal reacting power". And they know that a bullet-proof vest (with special made-of material) can stop a bullet.

I wish that all teachers, scientists, physicists when confronted by these intelligent, curious children would stop and ask themselves: "HOW, WHERE and WHEN does the phenomenon of "*the mutual actions of two bodies upon each other are always equal*" can insert itself into that solid chain of events that turned an old car into a small block of metal, or bullet – meeting no body armor – easily proceeded through human body.

And: "Let's assume it's true that at the moment of impact 'the force acting on each other is exactly the same'... How long would this phenomenon last? Is it long enough for the airbag to collapse the driver's chest and the empty cardboard boxes to smash the stuntman's body?"

With these questions in mind, they will recognize that Newton's 3rd Law is impractical from a physical point of view, to say the least. And they would desist from forcing their students to laboriously swallow the defected product that was fabricated over three centuries ago.

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I don't blame Newton for the lacking of vital details and misinterpretation of the nature's activities in his Laws of motion. During his life time, he knew nothing about the existence of Dark Matter. And although poorly written, his laws were accompanied with well established formulas, calculations that built a strong mathematical base and provided a great service to mankind.

Einstein also was not to blame even though he was getting so close to the truth, but was then distracted by his own imaginary physics.

I blame the *"Curvature of space-time."*

(1/2015 DL)