Errors in the Foundation of Einstein's General Theory of Relativity

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Albert Einstein formulated his general theory of relativity from a few simple observations that were made by an imaginary observer in a thought experiment. The experiment consisted of a man in a cage resembling a room, which was pulled by a rope and accelerated in a gravity-free space without man's knowledge.

Einstein came to the conclusion that the man in the cage would not be able perform any kind of experiments to determine whether he was in a room standing on the surface of the earth or whether he was in a room (or a cage) accelerating in a gravity-free space. Einstein believed that the indistinguishability between the two states comes from the equivalence between gravitational and inertial mass and that no experiment can be performed to distinguish one mass from another. In other words, the general theory of relativity hinges on the inability to perform the above mentioned experiments.

This paper will show that there is indeed a subtle difference between gravitational mass and inertial mass, that would enable us to distinguish one mass from the other and would also enable us to ascertain whether we are standing in a room on the surface of the earth or accelerating in the gravity-free space.

How the general theory of relativity was conceived—*Einstein's thought experiment*

Einstein's general theory of relativity emerged not from real experiments but from an imaginary or a thought experiment.

In an empty space *"so far removed from stars and other appreciable masses,"* Einstein contemplated *"a spacious chest resembling a room with an observer inside."* [1] Without the observer's knowledge, the ceiling of the chest is attached on the outside with a rope and pulled upward with a uniformly accelerated motion. Einstein asked this question: *"But how does the man in the chest regard this process?"* The force applied to the chest will be *"transmitted to him by the reaction of the floor of the chest."* The observer is then *"standing in the chest in exactly the same way as anyone stands in a room of a house on our earth."* [1]

To ascertain his situation, the observer can perform some experiments, like pulling things out of his pocket and dropping them on the floor. However, the moment an object leaves the observer's hands, the acceleration of the chest will no longer act on this object. The object will approach the floor of the chest with an accelerated motion, as perceived by the observer. In other words, the floor of the chest will be advancing toward the released objects. To the observer in this chest, however, everything would behave as if he were in a room on the earth where the same objects would be falling to the floor due to the effect of gravity. Einstein wrote:

> "If he (observer) releases a body which he previously had in his hand, the acceleration of the chest will no longer be transmitted to this body, and for this reason the body will approach the floor of the chest with an accelerated relative motion. The observer will further convince himself *that the acceleration of the body towards the floor of the chest is always of the same magnitude, whatever kind of body he may happen to use for the experiment*." [1]

He concluded: "*Relying on his knowledge of the gravitational field ... the man in the chest will thus come to the conclusion that he and the chest are in a gravitational field,"* rather then pulled in the gravity-free space.

At this point, Einstein asked this question: *"Ought we smile at the man and say that he errs in his conclusion?"* Einstein's answer was no.

> "I do not believe we ought to if we wish to remain consistent; we must rather admit that his (observer's) mode of grasping the situation violates neither reason nor known mechanical laws."

Einstein concluded that although the chest and the man in it are accelerating far away in the gravity-free space, we must regard the chest as being at rest in the gravity field of the earth. According to Einstein, therefore, *"we are able to produce a gravitational field merely by changing the system of coordinates."* [2]

The only experiment Einstein's observer in the chest has performed is to drop an object on the floor. To this observer (and to Einstein), it seemed that the motion of the object relative to the floor appeared identical to the motion of the same object if the chest were standing at rest in the gravity field of the earth.

From these observations, Einstein formulated the general theory of relativity and laws that govern the entire universe. In other words, no other experiment was performed by Einstein's observer that would have involved any kind of measurements so that his experiment could be interpreted in a numerical way.

Einstein further concluded that no experiment can be performed in the chest to ascertain these two situations (chest accelerating in gravity-free space at 32 ft/s/s and when the same chest is at rest on the surface of the earth where the gravitational acceleration is also 32 ft/s/s). In other words, these two situations are considered by Einstein equivalent and indistinguishable. It was Einstein's thought experiment that led Eric Chaisson and Steve McMillan to state in their textbook:

> "The crux of Einstein's argument is this: There is *no* experiment that you can perform from within the elevator (chest in Einstein's example), without looking outside, that will let you distinguish between these two possibilities. Thus, Einstein reasoned, there is no way to tell the difference between a gravitational field and an accelerated

frame of reference (which would be the rising elevator in the thought experiment). Gravity can therefore be incorporated into special relativity as a general acceleration of all particles." [3]

Einstein concluded the section on his thought experiment by saying:

> "We must note carefully that the possibility of this mode of interpretation rests on the fundamental property of the gravitational field giving all bodies the same acceleration, or, what comes to the same thing, on the law of the equality of inertial and gravitational mass. If this natural law did not exist, the man in the accelerated chest would not be able to interpret the behavior of the bodies around him on the supposition of the gravitational field, and he would not be justified on the grounds of experience in supposing his reference-body to be 'at rest.'" [1]

In other words, the inability to perform experiments to ascertain the above two situations is inseparably connected to the notion that there is no difference whatsoever between gravitational and inertial mass.

The concept of indistinguishability between acceleration and gravitation was extended to indistinguishability between the state of weightlessness in the gravity-free space and in the one felt during a free fall in a gravity field, as a consequence of the general theory of relativity.

Professor Richard Wolfson explained this equivalence:

> "... I am in the inter-galactic space far away from any gravitating object. In this situation I am really floating freely because there is no force acting on me at all. In the other situation (cables of an elevator are cut and everyone and everything in the elevator is in a free fall), there is a force of gravity and we fall downward, but because I am falling freely, and so is my whole environment, we do not notice the effect of gravity. ***So these two situations are also indistinguishable.*** What Einstein said is this: if I jump into a freely falling frame of reference, either in a dangerous one like the falling elevator, or much safer one like the spacecraft, I have done away with gravity." [4]

General relativity hinges on a few simple assumptions

The general consensus among physicists and textbook writers about the foundation of the general theory of relativity is expressed by Chaison and McMillan in the earlier quote:

> ***"The crux of Einstein's argument is this: There is* no *experiment that you can perform from within the elevator, without looking outside, that will let you distinguish between these two possibilities."***[3] (That is, between being in an accelerating elevator in the gravity-free space and being in an elevator at rest on the surface of the earth.) (Emphases added.)

From this and other assumptions stated in the previous quotes and following Einstein words *"... that our extension of the principle of relativity implies the necessity of the law of the equality of inertial and gravitations mass,"* [1] it is easy to see that the validity of Einstein's general relativity hinges directly on the following three principle assumptions:

1. Gravitational mass is equivalent to and indistinguishable from inertial mass, so that no experiment can be performed to establish a difference between the two.
2. No experiment can be performed to determine whether we are in a rocket accelerating far from any gravitational field, or whether we are in a rocket standing still on the surface of the surface of the earth where the gravitational force is acting upon it.
3. No experiment can be performed to differentiate whether we are experiencing weightlessness because of being at rest far into space with no gravity acting on us, or whether the weightlessness is due to a free fall in the gravity field.

Because Einstein's general relativity hinges on the above assumptions, if any one of the above-mentioned experiments is possible to conduct, then general relativity would be rendered invalid.

It is said that the tiniest differences often change everything. Are there such tiny and subtle differences that would have been imperceptible to the senses of the hypothetical observer in Einstein's thought experiment, and neglected by Einstein, so that his end conclusions would have to be modified?

An inequality that casts doubt on the equivalence between gravitational and inertial mass

A rod placed flat on a scale on the surface of the earth will weigh more than when placed vertically on the same scale. This is true whether we use a scale or a balance, as seen in *Fig. 1*, and whether we do this on earth or anywhere else in the universe were gravity is present. Therefore, it is a law of nature.

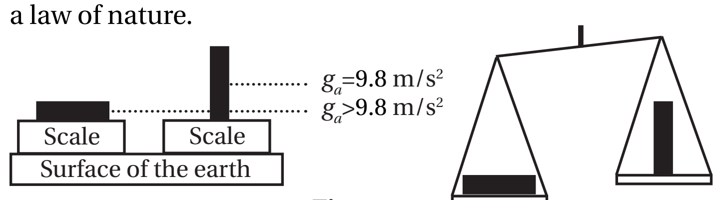

Figure 1

Because any piece of matter has three dimensions relative to the direction of the gravitational force—width, depth and height—along the height of any mass there are layers of matter. The distance from each layer to the center of the earth's gravity varies. Each layer and each particle exerts a slightly different force on the layer or on the particle next to it. This means that regardless of how small or narrow an object is, there is a difference in the amount of force that individual particles exert on each other.

Because "mass measured on a scale is called gravitational mass," **[5]** ***gravitational mass would depend on how an object is placed on a scale; it will depend on the shape of the object, on the distribution of matter within it, and on the overall distance of all of its particles from the center of gravity.***

This is not the case with *inertial* mass. The force that is needed to accelerate an object and all of its individual constituents does not depend on the shape of an object or on the distance of the individual particles or layers of matter in the object from the accelerating force, as shown in the following example.

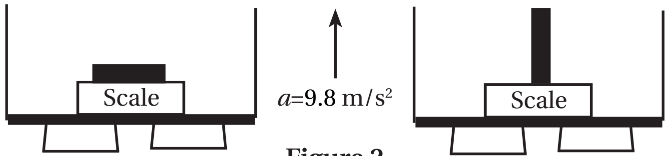

Figure 2

The scale on a rocket accelerating in the gravity-free space would only register the total resistance of the matter in the rod to the change in its state of inertia. Every constituent of the rod will be accelerated at the same rate.

Inertial mass depends on the quantity of matter that is resisting the change in its state of motion regardless of its shape, of the type of material, of the distribution of matter within it and regardless of the distance of its constituents from the center of the accelerating force.

A rod placed flat on a scale in an accelerated rocket in gravity-free space will weigh the same when placed vertically on the same scale *(Fig. 2)*.

This simple experiment proves that gravitational mass is not equivalent to inertial mass. This inequality will enable us to perform further experiments to prove the non-equivalence between inertial and gravitational mass and between gravitational acceleration and any other type of acceleration.

Proof #1
Flaw in Einstein's and textbooks' examples

The supposed equivalence between acceleration in gravity-free space and gravitational acceleration on the surface of the earth is usually demonstrated in textbooks of physics by an object being dropped by an observer, as was the case in Einstein's thought experiment, or by an object, a book, for example, being pushed off a table that was placed in an elevator or a rocket. The fall of these objects is supposed to be the same, making the above two situations equivalent and indistinguishable.

However, there is a great deal of idealization in these examples, which becomes apparent when we use more than one object in the same experiment, three cubes of unequal size, for example, as shown in *Fig. 3*.

In a rocket that is accelerating in gravity-free space, the three cubes are knocked off the table at the same time, or the table is removed from under the cubes *(Fig. 3a)*. Once the cubes start their fall, no force will be acting on them. The cubes will keep their spatial relationships, while the floor of the rocket will be moving toward them. To an observer in the rocket, it will look as though the cubes fell on the floor. Precision timing devices would show that all three cubes reached the floor at the same time.

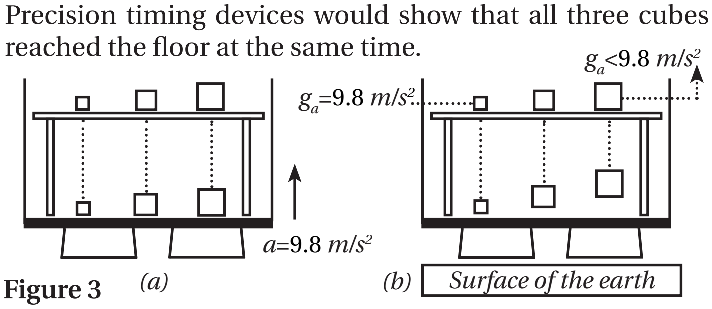

Figure 3

The situation changes when the same experiment is performed in the same rocket but parked on a launch pad on the surface of the earth *(Fig. 3b)*. The average distance of all particles of each cube from the center of gravity will be different. Once the table is removed from underneath the cubes, the gravitational force will act on them unequally. Because the distances from the center of mass of each cube to the center of gravity are different, each cube will fall at a different rate. The smallest cube, which would have its center of mass closest to the earth, would thus possess the greatest rate of average acceleration and would therefore reach the floor first.

While describing a similar experiment, professor Wolfson used the plural when he said in his audio lectures: *"I start doing experiments, I drop balls, I throw balls in the air ... everything acts the same as it did on earth."* [4]

In our experiment we also used multiple objects, but not everything acted the same. The timing devices onboard the rocket on the launchpad would tell us that the cubes in *Figure 3b* took different amounts of time to reach the floor. In the above two situations, the identical sets of cubes are pushed off the table in the same manner, but the cubes reached the floor at different times. The above two situations in *Fig. 3a* and *3b* are neither equivalent nor indistinguishable. Contrary to what Einstein thought, the observer in either rocket can easily determine in which rocket he is located.

Therefore, the moment we move from an idealized situation, as conceived by Einstein in his thought experiment, to a real and a more complete one, the equivalence between the two situations ceases to exist.

Proof #2
How to ascertain whether we are in a rocket accelerating in gravity free space from being in a rocket at rest in the gravity field?

Suppose we are in a rocket without knowing whether the rocket is accelerating in gravity-free space or standing still on a launch pad on the surface of the earth. We could perform the following experiment in order to ascertain our situation: We could drop two cubes on the "floor" of the rocket, two empty boxes each 1 meter in diameter, for example, stacked on top of each other. On the side of one of the boxes, we would place a laser distance-measuring device, while on the other box we would place a mirror so that the laser beam from the laser distance-measuring device bounces back to the laser. We would thus be able to monitor the change in separation between the two boxes during the fall. The distance between the laser and the mirror would be 1 meter, as shown in *Fig. 4a*. The air is evacuated so that no other force is acting on the two boxes.

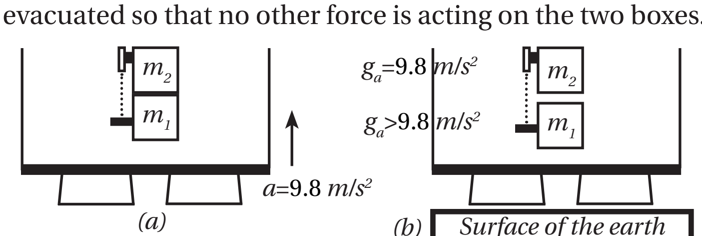

Figure 4

If the two boxes were released when the rocket was accelerating in the gravity-free space, there would be no force that could act on them from the moment they are let free *(Fig. 4a)*. The boxes would thus stay together, while the floor of the rocket would be advancing toward them and eventually hit them.

If we perform the same experiment when the rocket is standing still on a launch pad on the earth's surface, the experiment would yield a different result *(Fig. 4b)*. When the two boxes are released in the same manner, they would fall in the gravity field at two different rates of acceleration. They would begin to separate from each other the moment they begin their fall.

After a free fall in the gravity field of the earth of only 1 second, the two boxes would separate from each other by approximately 1,541 nanometers or approximately 4 wavelengths of violet light (λ=380 nm). Our distance-measuring device would be able to register this difference, and we would be certain that our rocket is parked on a launch pad and not accelerating in gravity-free space.

Proof #3
How to distinguish the state of weightlessness in gravity-free space from weightlessness due to a free fall in the gravity field?

To get used to the state of weightlessness in space, astronauts often train in planes that dive toward the earth from high altitudes. The plane and everyone and everything in the plane experience a free fall in the gravity field. Everything falls at nearly the same rate. This fall can last only about a minute, or less. The pilot must start the engines and get out of the dive to prevent crashing.

Another type of weightlessness is the one we experience when we are far away from any gravitational field. Suppose we are in a non-accelerating rocket in intergalactic space where no gravity is present *(Fig. 5a)*. The cabin is air-free so that nothing would interfere with the experiment we are about to perform. We let two boxes that are touching each other float in the cabin. Each box is 1 cubic meter in size and weighs 1 kg. If no force is acting on the boxes, they will stay in that state forever.

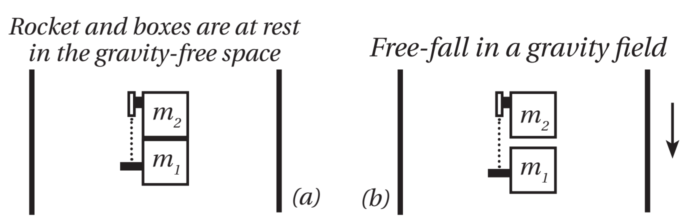

Figure 5.

Suppose we perform the same experiment in a plane that is freely falling from a high altitude, pulled by the gravity of the earth, as shown in *Fig. 5b*. We have only about 60 seconds to perform this experiment.

While we are in the state of weightlessness, that is, falling free in the gravity field of the earth, we let two boxes fall free in the same manner as in the first example. The boxes are touching and standing on top of each other relative to the fall. Because the boxes would be falling at nearly the same rate as us, we would be able to observe what happens to them. At the moment we let the two boxes free, the center of mass of one box would be 1 meter farther from the center of the earth's gravity. The two boxes would be falling at different rates of acceleration. The boxes would start separating from each other the moment we let go of them.

The difference in the distances traveled by the two boxes during the 60-second free fall would be about 5.5 mm, approximately the thickness of a french fry. Because we would be falling at nearly the same rate, we could observe the separation between boxes taking place in front of our eyes. By measuring the magnitude of separation during a certain time period, we could determine the rate of acceleration of the plane, and from that we could determine our altitude above the surface of the earth at any time during the free fall.

The separation would be so large that if the boxes in this experiment were 100 times smaller in height, the size of two dice (approximately 1 cm^3 each), it would still be within the capability of the existing measuring devices to determine the separation between boxes after only a few seconds of a free fall in the gravity field of the earth. If we were falling together with the two dice at nearly the same rate, we would be able to observe with our naked eyes the light passing through the separation between the dice within a few seconds of the free fall. Within the first second of the free fall, the separation would be approximately 15 nm (nanometers). After only 10 seconds, the separation would increase to over 1,500 nm, or approximately 4.5 wavelengths of violet light. A beam of visible light could pass through this separation and be detected by our naked eyes or by a photomultiplier.

If we did not know whether we were weightless because of a free fall in the gravity field or because we were in gravity-free space, we could perform this simple experiment without any instruments and determine precisely where we were by relying strictly on our sense of vision.

We can conclude then that weightlessness due to the free fall in the gravity field and weightlessness in gravity-free space are indeed ***distinguishable*** and that we can perform experiments to prove it.

In regard to this comparison, Wolfson stated in the earlier quote:

> "I am in the intergalactic space far away from any gravitating object, and in that situation I am really floating freely, because there is no force on me at all. In the other situation (the cables of an elevator are cut and everything in the elevator is in a free fall), there is a force of gravity and we fall downward, but because I am falling freely, and so is my whole environment, we do not notice the effect of gravity. ***So these two situations are also indistinguishable***." [4]

However, we have just shown that the two states of weightlessness are not indistinguishable and that we can perform experiments to distinguish one state from the other. That means that because of this ***distinguishability*** between the two states, we cannot exchange one for the other, as

Einstein thought. Wolfson summarized Eisntein's reasoning with the following words:

> "What Einstein said is this: if I jump into a freely falling frame of reference, either in a dangerous one like the falling elevator, or much safer one like the spacecraft, I have done away with gravity." [4]

But this reasoning cannot hold, as gravitational acceleration cannot be substituted with any other kind of acceleration.

Proof #4 - The simplest proof
A drop of water let free in a rocket accelerating in gravity-free space retains its shape but elongates when falling in a gravity field

When a drop of water is let free in a rocket accelerating in a gravity free space, no force of any kind will be acting on it. The drop will retain its shape until the "floor" of the rocket hits it, as shown in *Fig 6a*.

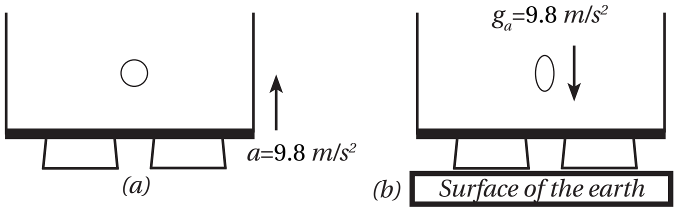

Figure 6

A drop of water let free in a rocket parked on the launch pad *(Fig. 6b)* will elongate, as it falls and accelerates in the earth's gravity field, making it easy to distinguish the two types of accelerations.

This is the simplest, the most vivid and the most compelling proof against Einstein's principle of equivalence. By observing the shape of the water drop, we can positively determine whether we are in a rocket accelerating in the gravity-free space or in a rocket standing still in the gravity field on the surface of the earth.

The same experiment will let us distinguish the state of weightlessness in gravity-free space from weightlessness due to a free fall in a gravity field. In the first situation, we can observe the unchanged shape of the floating water drop and determine that we are experiencing weightlessness in the gravity-free space.

In the second situation, by observing the elongation of the water drop as it falls in the gravity field at nearly the same rate as us, we can positively determine that we are experiencing weightlessness due to the free fall in the gravity field.

In other words, we can perform simple experiments to distinguish the above two types of weightlessness and prove their non-equivalence.

Two principles of non-equivalence

From the arguments and proofs presented so far and because *a rod would weigh more when placed on a scale horizontally rather than vertically*, while no weight difference would be observed when weighed in a rocket accelerating in the gravity-free space, the following principles emerge:

The principle of non-equivalence between gravitational mass and inertial mass states that these two masses are neither equivalent nor indistinguishable from each other and that we are able to perform experiments to prove it. It is because of this non-equivalence between the two masses that we are able to conduct experiments to distinguish the state of acceleration in a gravity-free space from gravitational acceleration on the surface of the earth or to distinguish the state of weightlessness in gravity-free space from weightlessness due to a free fall in the gravity field.

The principle of non-equivalence between gravitational and inertial mass leads directly to another non-equivalence principle:

2. The principle of non-equivalence ***between acceleration produced by other forces and acceleration produced by the gravitational force states that there is not an exact physical equivalence between the two types of acceleration; gravity is thus a unique phenomenon of nature; there is no other force like it and nothing in nature can be equated to it. Acceleration produced by other means is similar to gravitational acceleration because gravity gives objects acceleration, but that is where the similarities stop. Gravitational force gives every particle of a body a different rate of acceleration that depends exclusively on particles' distances from the center of gravity—a hallmark from which gravity gets its unique character.***

All objects fall at different rates of acceleration in a gravity field

In ancient Greece and up to Galileo's time, it was believed that bodies with larger mass would fall at a faster rate of acceleration on the surface of the earth. The Aristotelian view that *"the downward movement of a mass of gold or lead, or of any body endowed with weight is quicker in proportion to its size,"* [6] held its ground for more than 2,000 years.

Galileo was the first to propose, early in the 17th century, that all bodies fall at the same rate in the gravity field regardless of size, shape or the amount of matter within them. It is believed that the same rate of fall comes from the fact that the inertial mass of an object is equivalent to and indistinguishable from its gravitational mass. This view has survived to the present day.

A graphic experiment to prove this notion was performed by astronauts on the moon during one of the Apollo missions. Professor Wolfson described the result of this experiment with these words: "The hammer and the feather fell at the same rate and reached the surface of the moon *at the same time*." [4]

In order for the feather and the hammer to fall at the same rate, the two objects would have to start the fall with their centers of mass at the same exact distance from the center of the earth's gravity field. Physics textbooks never mention the positions of the centers of mass of the falling bodies or their role in the rate of fall. However, the alignment of the centers of mass of different bodies is very difficult to achieve, if not impossible. A single molecule could make a difference in achieving perfect alignment. In reality, all bodies that fall in the gravity field would have their centers of mass at a different distance from the center of gravity. We can come close to aligning these bodies to this ideal position but may never reach the exact one. Regardless of how small a difference might remain, the inverse square law and sufficient amount of time will eventually allow for these minute differences to express themselves.

The Shoemaker-Levy 9 comet illustrates this notion. At about a year time before the impact with Jupiter in 1994, many fragments that constituted the comet were almost at an equal distance from Jupiter and falling in its gravity field at nearly the same rate. The minute differences resulted in huge distances between the fragments as they approached Jupiter that measured in hundreds of thousands of kilometers.

Most likely, no two fragments (or even two dust particles) of the trillions of parts of this comet fell in the gravity field of Jupiter at the same rate of acceleration and reached the planet at the same time. The most prevalent occurrence in nature is that all particles and objects fall in a gravity field at different rates of acceleration.

The two new principles of non-equivalence allow us to make a more appropriate statement of the law concerning the free fall in the gravity field:

All bodies fall in a uniform gravity field at a different rate of acceleration, which depends on the average acceleration that the gravity gives to all constituents of each body or on the average distance of all particles of each body from the center of gravity, with the exception of an idealized situation when this average distance is exactly equal for all bodies, then the bodies would fall at the same rate regardless of the amount of matter they possess.

The distinction made by the new definition of this law is very important. Because of this distinction, it is possible to perform experiments on a rocket to determine whether we are accelerating in gravity-free space or standing still on a launch pad on the surface of the earth.

The incomplete law that states that *all bodies fall at the same rate in the gravity field*, which was first defined by Galileo, was responsible for the erroneous belief, which survived for a few centuries, that the alternative statement of this law is that inertial mass is equivalent to gravitational mass. In its turn, this notion of equivalence led Einstein to an incorrect conclusion that any kind of acceleration and gravitational acceleration are equivalent and that no experiment can be performed to ascertain whether we are in a rocket accelerating in the gravity-free space or standing still on the surface of the earth, a view that survived to the present time.

Einstein's concept of the curvature of space and time cannot hold

It is a generally accepted assumption that, "When Albert Einstein developed his general theory of relativity as a new theory of gravity, he build it on the equivalence of inertial and gravitational mass." [7]

Indeed, it was shown in this paper that Einstein's general theory of relativity hinges on the indistinguishability between inertial and gravitational mass, that is, from being in a gravitational field and being accelerated in a gravity-free space or between the state of weightlessness due to a free fall in a gravity field and the state of weightlessness at rest in gravity-free space.

Professor Serway explained the connection between Einstein's principle of equivalence and Einstein's concept of the curvature of space and time in his textbook, *Physics for Scientists and Engineers*, with the following words:

> "Einstein's insight was the recognition that, to an observer inside a freely falling laboratory, not only should objects float as if gravity were absent as a consequence of this equality (between gravitational and inertial mass), but also all laws of nongravitational physics, such as electromagnetism and quantum mechanics, should behave as if gravity were truly absent."
>
> "This idea is now known as the Einstein Equivalence Principle, and it was a key step, because it implied converse: that in a reference frame where gravity is felt, such as in a laboratory on Earth's surface, the effects of gravitation on physical laws can be obtained simply by mathematically transforming the laws from a freely falling frame to the laboratory frame. According to the branch of mathematics known as differential geometry, this is the same as saying that space-time is curved; in other words, that the effects of gravity are indistinguishable from the effects of being in curved space-time." [8]

What Serway is saying is that Einstein's principle of equivalence, that is, the equivalence between gravitational acceleration and acceleration achieved by other means, and the equivalence between gravitational and inertial mass, and, also, the notions that no experiment could be performed to contradict these equivalences, lead directly to the notion that being in a gravity field is indistinguishable from being in a curved space. This curving is often called the warping of space and time, or, as one fused entity, warping of space-time.

Therefore, the concept of the curvature of space and time, or the warping of space-time, is directly related to the notion of the indistinguishability between the state of standing in a gravitational field and the state of being accelerated in a gravity-free space or between the state of weightlessness due to a free fall in a gravity field and the state of weightlessness at rest in gravity-free space.

The notion of indistinguishability means that there is no mathematical difference between the above states. Therefore, no experiment could be performed to distinguish one state from another.

However, the two principles of *non-equivalence* as defined earlier contradict Einstein's and Serway's conclusions. In other words, we can distinguish acceleration due to gravity from any other kind of acceleration, and we can perform experiments to prove it. Therefore, there is no theoretical, mathematical or practical basis for the use of differential geometry to arrive at the curvature of space or fusing of space and time into one entity. Space and time are separate phenomena. ***Gravity does not affect time itself, it only affects the measurement of time***. Hence, Einstein's concept of gravity being the curvature of space and time cannot hold. Einstein's general theory of relativity and his theory of the curvature of space emerged from utterly simple observations and loose analogies. Based on equally simple but more complete and thorough observations, arguments presented in this paper render Einstein's general theory of relativity and his theory of gravitation invalid.

Thus, after a few millennia of human effort to understand the nature of gravity, we are still at the same point where Newton left off, as gravity remains the least understood and the most elusive phenomenon of nature.

References

[1] Albert Einstein, *Relativity*, Crown Trade Paperbacks, NY, 1961, p. 75-78.
[2] Albert Einstein, *The Foundation of the General Theory of Relativity*, Annalen der Physik 49, 1916, Dover Pub. Co.
[3] Eric Chaisson & Steve McMillan, *Astronomy Today*, Prentice Hall, 1993, p. 505.
[4] Richard Wolfson, *Einstein's Relativity and Quantum Revolution*, Audio Lectures, Part 1, Teaching Co., 1995.
[5] Peter Nolan, *Fundamentals of College Physics*, W.C. Brown Publishers, 1993, p. 92.
[6] Aristotle, *On the Heavens*, Book IV, Chapter 2. www.logoslibrary.org/aristotle/heavens/42.html
[7] Ivars Peterson, *A New Gravity*, Science News, Volume 146, pg 376
[8] Raymond A. Serway, *Physics for Scientists and Engineers*, Saunders College Pub., 1990, p. 1137.