# RELATIVELY LOST IN RELATIVITY

## A CAUTIONARY TALE OF THE PERILS OF USING THE WRONG EXPERIMENTAL DESIGN

Second Edition Abbreviated

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# A CAUTIONARY TALE ...

What we can learn from an experiment is limited to what its experimental design is capable of telling us.

Experiments typically are designed to examine phenomena we do not yet understand. Thus, we necessarily must base their design on an incomplete understanding of how to detect what we are looking for.

Every experiment produces observations. But observations are meaningless until we interpret them. And whether or not that experimental design provides everything we need to know to correctly interpret them is not just unknown, it is unknowable.

There is no way to assess the significance of whatever it may have failed to disclose.

That is why we must leave some room for doubt even about the most thoroughly tested and validated theories in our arsenal. In the words of Richard Feynman:

> "Things must be learned only to be unlearned again, or more likely to be corrected."
>
> Richard Feynman, 1963

This analysis reveals a fatal flaw in the first postulate of relativity.

It does so in eight analytical steps with supporting references to generally accepted theory.

What it shows is that, according to generally accepted theory, Newton's laws of motion do not conform to Galileo's relativity principle.

The belief that they do conform is based on the use of an inadequate experimental design.

## THE EIGHT DISTINCT STEPS USED IN THIS ANALYSIS:

Step 1. Provides some basic concepts for non-professional viewers.

Step 2. Presents what generally accepted theory (GAT) tells us about the first postulate of relativity (i.e., that Newton's laws produce results that conform to Galileo's relativity principle).

Step 3. Presents what GAT tells us about Galileo's relativity principle.

Step 4. Presents what GAT tells us about Newton's first two laws of motion.

Step 5. Combines Newton's and Galileo's experimental designs into a single experimental design. This design compares how Newton's laws treat changes in motion, from one inertial reference frame to another, with how the relativity principle treats the resulting differences in motion (a.k.a. relative motion) between the same two reference frames. Contrary to what GAT tells us about the first postulate, the two do not agree.

Step 6. Uses that design to reveal fatal flaws in the experimental design used to address the special theory for more than a century. Those flaws have hidden the first postulate's flaw from discovery.

Step 7. Uses that design to reveal that Newton's laws and Galileo's relativity principle are different in kind. They address different aspects of motion having different causes and different effects.

Step 8. Reveals that every observer's perception and definition of motion is totally subjective and is different in every different inertial reference frame. Thus, just as revealed by Maxwell's research on the propagation of light, there can be only one inertial reference frame in which observations will be correct.

# STEP 1.

# Essential concepts

## ESSENTIAL CONCEPTS WHICH ARE CENTRAL TO THIS ANALYSIS

Three specific concepts of motion are at the very center of this analysis:

1. The first is the nature of inertial and non-inertial motion.

2. The second is the nature of inertial and non-inertial reference frames.

3. The third is the nature of vectors.

Since this analysis is intended for both professional and nonprofessional viewers, it is worth introducing these concepts before continuing.

## 1. THE NATURE OF INERTIAL AND NON-INERTIAL MOTION

- An object whose motion is not changing is in inertial motion. That includes both being stationary and moving at a constant speed in a constant direction. An object's unchanging motion is maintained by inertia. Inertia is an innate characteristic of an object's mass, which has the effect of opposing any change in the object's motion. The greater an object's mass, the greater is its inertia and the greater is its resistence to having its motion changed.*

- An object whose motion is changing, either in speed, direction or both, is in non-inertial motion. Non-inertial motion occurs when an unopposed external force (a.k.a. a net force) is applied to an object to compel it to change its motion. The greater the force, the stronger its compulsion and the more quickly the object's motion will change (a.k.a.. the faster it will accelerate).**

* Douglas C. Giancoli, *Physics*, 4th Edition (Englewood Cliffs, New Jersey: Prentice Hall, 1995), 76-79, 743.

** Ibid.

## 2. WHAT ARE INERTIAL AND NON-INERTIAL REFERENCE FRAMES?

- A reference frame is simply a place where experiments can be conducted and where observations can be made. Examples are a laboratory in a building, a car, an airplane, a boat, an ice floe, etc. *

- A reference frame whose motion is not changing is called an inertial reference frame. That includes moving at a constant speed in a constant direction (i.e., in a straight line) or being stationary.** If your reference frame is a car, it will be an inertial reference frame if you are parked at the curb or are driving at any constant speed in any unchanging direction.

- If your car is accelerating, decelerating or going around a curve, it is a non-inertial reference frame.***

* Giancoli, *Physics*, 20.

** Ibid., 743.

*** Ibid.

# 3.WHAT IS A VECTOR?

A vector is something that has both a magnitude and a direction.* For example, the motion of a truck speeding down a straight road at 80 miles per hour is a vector. The name for a vector involving speed is velocity. An object's velocity defines both its speed and its direction.

If you pay attention only to the truck's speed, and walk in front of it, you will learn that the direction part of its velocity can be very important.

To capture both direction and magnitude, vectors typically are shown as arrows, with the length depicting its magnitude and the direction it is pointing indicating its direction.


* Giancoli, *Physics, 23-24.*

## STEP 2.

## What generally accepted theory tells us about Einstein's first postulate of relativity:

# A BRIEF HISTORY OF EINSTEIN'S FIRST POSTULATE OF RELATIVITY

1. Galileo created his relativity principle in 1632 based on experiments involving the motion of physical objects.*

   - Motion can be defined only relative to a specified frame of reference (e.g., the reference frame from which an object's motion is observed).
   - An experiment will produce the same result in every inertial reference frame (the experiment will be motionless relative to an observer in the same inertial reference frame).
   - The effect of relative motion between any two inertial reference frames, on the result of an experiment conducted in one and observed from the other, will work the same way in both directions

2. Newton created his laws of motion in 1687 based on experiments involving the motion of physical objects.**

   - An object will remain in inertial motion unless an unopposed external (i.e., net) force is acting on it to compel it to change.
   - A net force applied to an object for an interval of time will change its motion from one inertial state of motion to another. Changes in motion, being vectors, will work in one direction only.

* http://physicscentral.com/explore/plus/galilean-relativity.cfm
** Giancoli, *Physics*, 23-34, 76, 167.

# A BRIEF HISTORY OF EINSTEIN'S FIRST POSTULATE OF RELATIVITY

3. Newton's laws and Galileo's relativity principle were combined in the Newtonian relativity principle based on the belief that Newton's laws will produce results that conform to Galileo's relativity principle.*

4. James Clerk Maxwell solved the mysteries of electricity and magnetism in 1864. He finds that light is an electromagnetic wave that transits empty space at precisely $3 \times 10^8$ meters per second. However, he also found that its speed can be measured correctly only from one unique inertial reference frame. Observations made from any other reference frame had to be adjusted to correct for the observer's motion relative to Maxwell's unique reference frame.**

   This would mean that light did not follow the relativity principle unless there was a physical medium throughout space through which light traveled at its constant speed.

   Just like sound traveling through air, the characteristics of its medium of propagation would determine its speed. One would have to be stationary in that medium to measure light's speed correctly.

* Giancoli, *Physics,* 743

** Cox, Brian and Jeffery Forshaw, *Why Does E=MC²:(and why should we care?),* (Cambridge, Massachusetts: De Capo Press, A Member of the Perseus Books Group, 2009), 28.

## A BRIEF HISTORY OF EINSTEIN'S FIRST POSTULATE OF RELATIVITY, CONTINUED

5. Following numerous attempts to detect and analyze light's medium of propagation, A.A. Michelson and E.W. Morley proved that there was no medium of propagation for light. Thus, there was no explanation for the propagation of light to violate the relativity principle. It was a complete mystery.*

6. Then, in 1905, Einstein declared that Maxwell's unique reference frame was based on an invalid belief that there was such a thing as a reference frame at absolute rest. Everything in the universe is in motion relative to everything else. Thus, motion can be defined only relative to a defined frame of reference. He then declared that Newton's laws of motion apply to all phenomena involving motion, including the propagation of light, and <u>will produce results which conform to Galileo's relativity principle without need for any form of adjustment.</u> This is stated in his first postulate of relativity as:

> "The laws of physics have the same form in all inertial reference frames." * *

* Giancoli. *Physics*, 746-749.

** Giancoli, *Physics, 750.* Goldsmith, Dr. Donald, and Robert Libbon, *Einstein: A Relative History* (New York: Simon & Schuster, Inc., 2005), 70.

## CHANGE VERSUS DIFFERENCE

For purposes of clarity, throughout the rest of this analysis, material which addresses changes in motion will be shown in red and material which addresses differences in motion (a.k.a. relative motion) will be shown in blue.

This is because the purpose of this analysis is to compare how generally accepted theory treats the effects of a change in motion (according to Newton's laws) with how it treats the effects of the resulting difference in motion (according to Galileo's relativity principle) between the same observers watching the same experiments in the same inertial reference frames.

# STEP 3.

## What generally accepted theory tells us about Galileo's relativity principle:

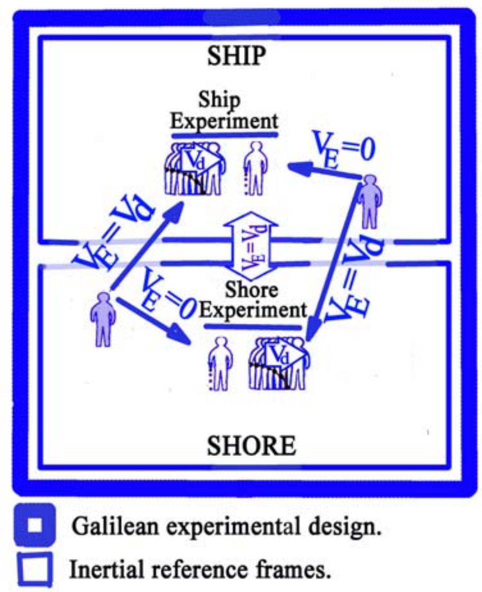
# GALILEO'S RELATIVITY PRINCIPLE *

A ship is moving to the right at a velocity $V_d$ relative to the shore. Experiment's are conducted on the ship and on the shore in which an experimenter drops a ball. An observer on the ship and one on the shore each observe both experiments.

Terms: $V_E$ is the relative velocity between an experiment and its observer.
$V_d$ is the relative velocity between reference frames.

Observations:

- Each experiment is motionless relative to the observer in the same inertial reference frame (when $V_E=0$, ball falls vertically).
- Each observer sees the experiment in the other inertial reference frame as moving at $V_E=V_d$. (ball falls on a curved trajectory.)



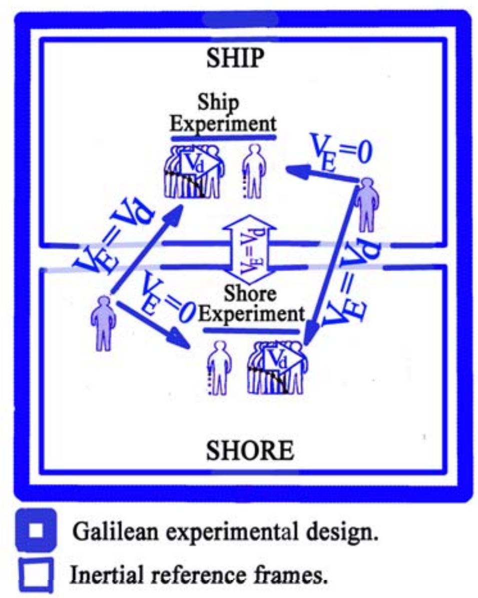

* University of California, Riverside (http://physics.ucr.edu/~wudka/Physics7/Notes_www/node47.html) Accessed April 10, 2017.
American Physics Society (http://physicscentral.com/explore/plus/galilean-relativity.cfm)

# GALILEO'S RELATIVITY PRINCIPLE *
## (Continued)

Note that the Gallilean experimental design consists of two inertial reference frames moving at a constant velocity (e.g. $V_d$) relative to each other.

Conclusions:

- Motion can be defined only relative to its observer's frame of reference.
- An experiment's results will be the same in every inertial reference frame
- The difference in motion between any two inertial reference frames works the same way in both directions.




* University of California, Riverside (http://physics.ucr.edu/~wudka/Physics7/Notes_www/node47.html) Accessed April 10, 2017. American Physics Society (http://physicscentral.com/explore/plus/galilean-relativity.cfm)

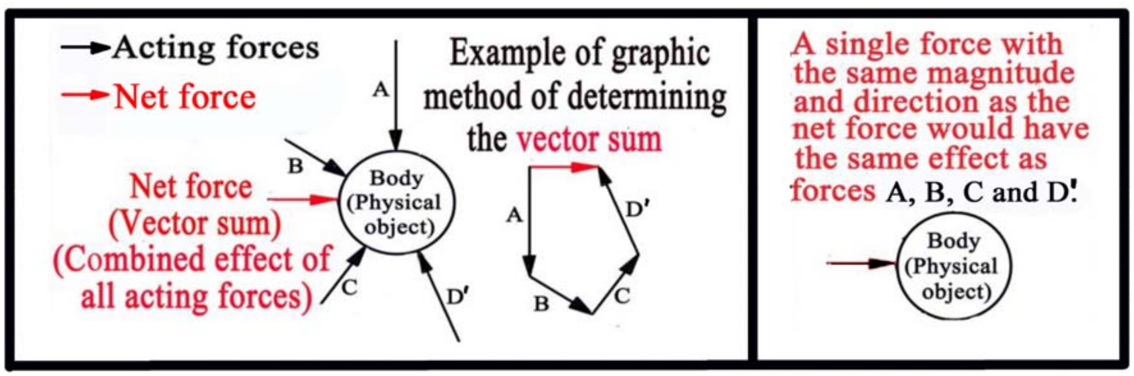
## STEP 4.

## What generally accepted theory says about Newton’s first two laws of motion:

## DEFINITION OF TERMS IN NEWTON'S FIRST LAW*

- Body: A physical object.

- Net force: The vector sum of all external forces acting on a physical object (i.e., the sole remaining force acting on an object after all supporting and opposing forces have been netted out). It acts as a single, unopposed, external force.




* Cutnell, John D. and Kenneth W. Johnson, *Physics*, 5th edition (New York: John Wiley & Sons, Inc. 2001), 85-86.

## NEWTON'S FIRST LAW OF MOTION

"Every body continues in its state of rest or of uniform motion in a straight line unless it is compelled to change by a net force acting on it."*

In plain English: A physical object will be in inertial motion unless an unopposed external force (i.e., a net force) is applied to it to compel it to change.

This also means:

1. If an unopposed external force is not applied to a physical object, its motion will not change. It will be in inertial motion. This can be abbreviated as: No force, no change.

2. If an unopposed external force is applied to a physical object, its motion will change. It will be in non-inertial (i.e., changing) motion until such time as the force is removed.

3. After the force is removed, the change in the object's motion will have moved it to a different inertial reference frame than it was in before.

* Giancoli, *Physics*, 76.

# NEWTON'S SECOND LAW OF MOTION

- "The rate of change of momentum of a body is proportional to the net force applied to it." *
- To cut to the quick, the change in an object's velocity caused by a force applied to it for a given period of time is:

$$\Delta v = \frac{F}{m} \Delta t^{**}$$

Terms shown in red are vectors.

| | |
|---|---|
| $\Delta v$: Change in velocity | F: unopposed external (net) force applied to the object |
| $\Delta t$: The inerval of time that the force is applied | m: The object's mass |

- A force is a vector; it has a magnitude (how hard it pushes or pulls on the object) and a direction (the direction in which it pushes or pulls). Thus, changes in velocity are vectors. They have both a speed and a direction.

* Giancoli, *Physics,* 167, Equation 7-2.

** Ibid., 167, Derived from Equation 7-2.

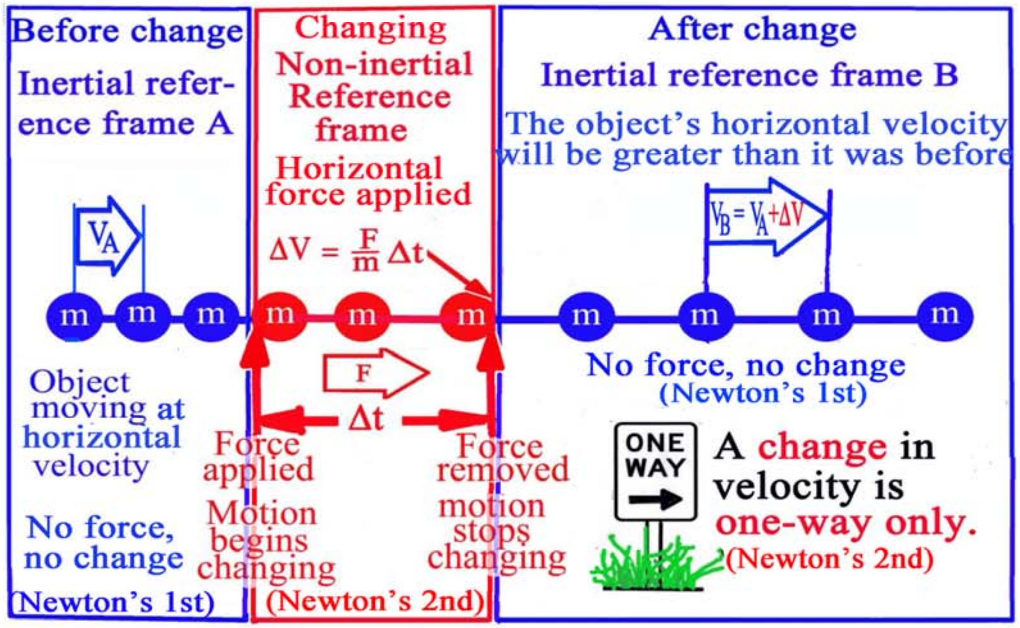
*** Ibid., 23-24.

Vectors only work in one direction.***

# USING THE NEWTONIAN EXPERIMENTAL DESIGN*
# TO ILLUSTRATE NEWTON'S FIRST TWO LAWS AT WORK.

## Changes in motion are one-way only.

**If Newton's second law is valid, then a force applied to an object will change its velocity only in the same direction as that of the force being applied. After the force is removed, the object will be in a different inertial reference frame.**



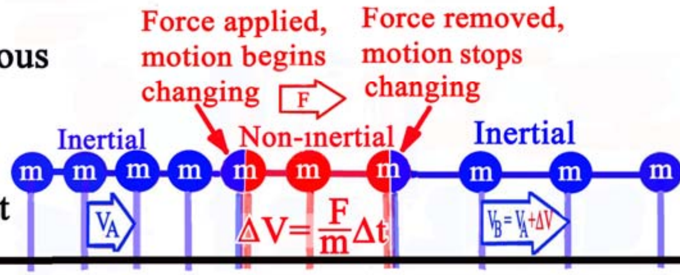

* Note that the Newtonian design adds a non-inertial reference frame between the two inertial reference frames to address the effect of the change in the object's motion.

IT TAKES THE NEWTONIAN EXPERIMENTAL DESIGN TO TELL US THAT CHANGING AN EXPERIMENT'S VELOCITY FROM ONE INERTIAL REFERENCE FRAME TO ANOTHER WILL CHANGE THE EXPERIMENTAL RESULT.

**It will not be the same in both inertial reference frames!**

Applying a force to an object for a period of time changes its velocity from that of one inertial reference frame to that of another.

From previous slide: Changing the motion of an object




Object's velocity is different in the new inertial reference frame.

IT TAKES THE NEWTONIAN EXPERIMENTAL DESIGN TO TELL US THAT CHANGING AN EXPERIMENT'S VELOCITY FROM ONE INERTIAL REFERENCE FRAME TO ANOTHER WILL CHANGE THE EXPERIMENTAL RESULT.

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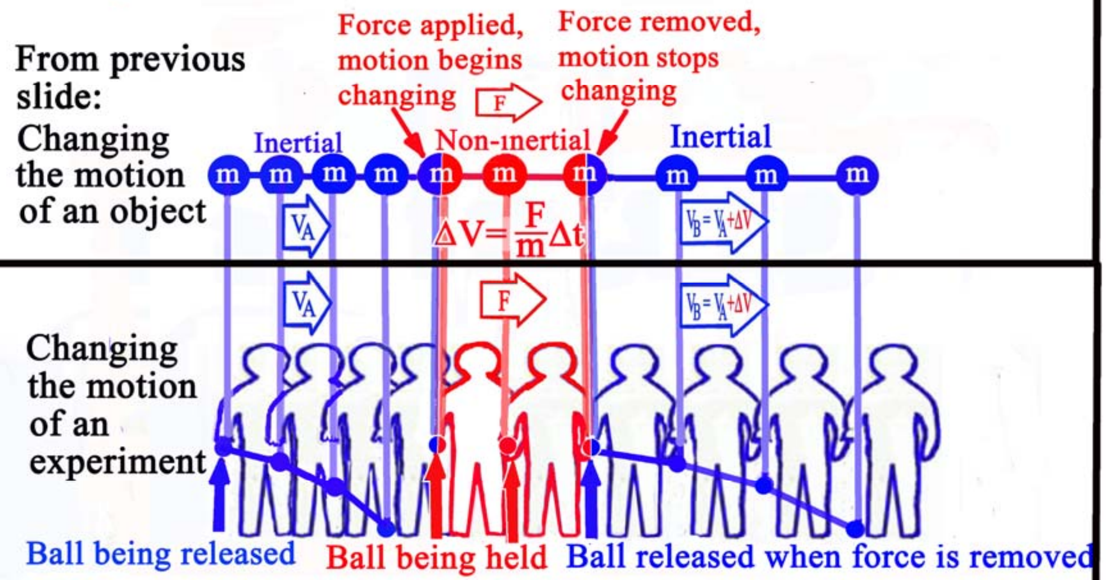


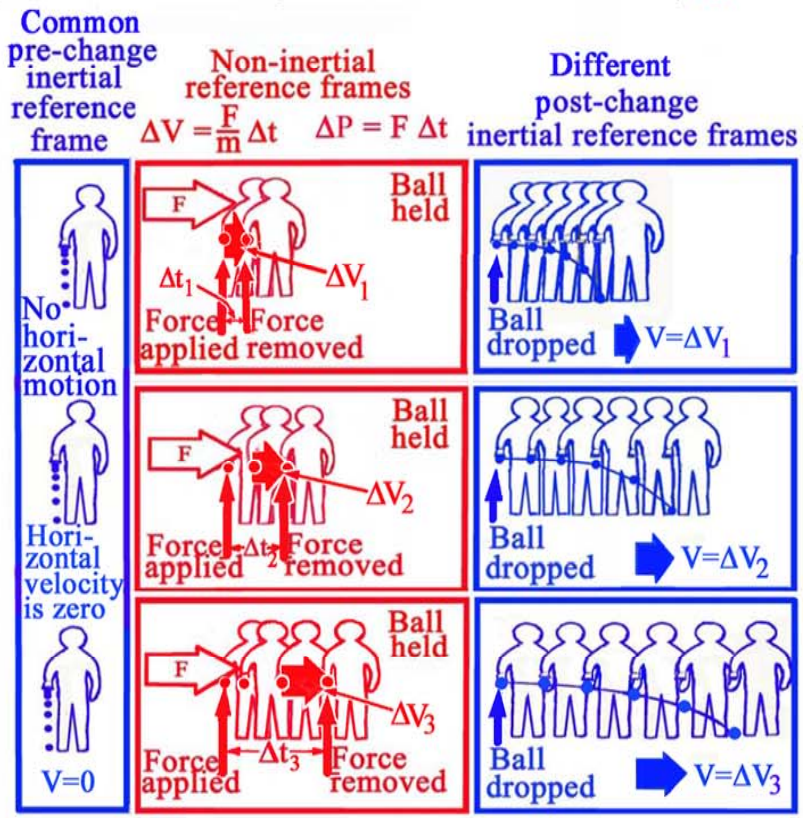

Applying a force to an experiment for a period of time changes its velocity, which also changes the experimental result. The ball follows a different trajectory when dropped after the change in the experiment's velocity than it did before. Contrary to the belief underlying the first postulate, Newton's laws do not produce the same result in every inertial reference frame. The result can look the same, depending on the reference frame from which it is observed, but cannot be the same.

## ANOTHER INSIGHT THAT REQUIRES THE NEWTONIAN EXPERIMENTAL DESIGN

(An experiment's results are different in every inertial reference frame.)

According to Newton's 2nd law of motion, changing an experiment's inertial motion from a common starting velocity to different post-change velocities will produce a different result in every one of them.

The greater the interval of time $\Delta t$ that the force F is applied, the greater will be the change in the ball's horizontal velocity $\Delta V$.




Ball locations are shown at uniformly spaced instants in time.

## THE UNANSWERED FOUNDATIONAL QUESTION:

Do Newton's laws conform to Galileo's relativity principle?

Experiments used both to apply and to validate the special theory for more than a century have been based on observations made from inertial reference frames of objects in inertial motion* (a.k.a. the Galilean experimental design). That is because the special theory deals exclusively with inertial motion.

However, Newton's laws deal primarily with changes in motion, which occur in non-inertial reference frames. There are no non-inertial reference frames in the Galilean experimental design.

As a result, the belief that changes in motion, as per Newton's laws, will have the same effect as the differences in motion caused by those changes, as per Galileo's relativity principle, has never even been empirically examined. Whether or not they agree is a question that has never even been asked, let alone answered.

* Giancoli, *Physics*, 743.

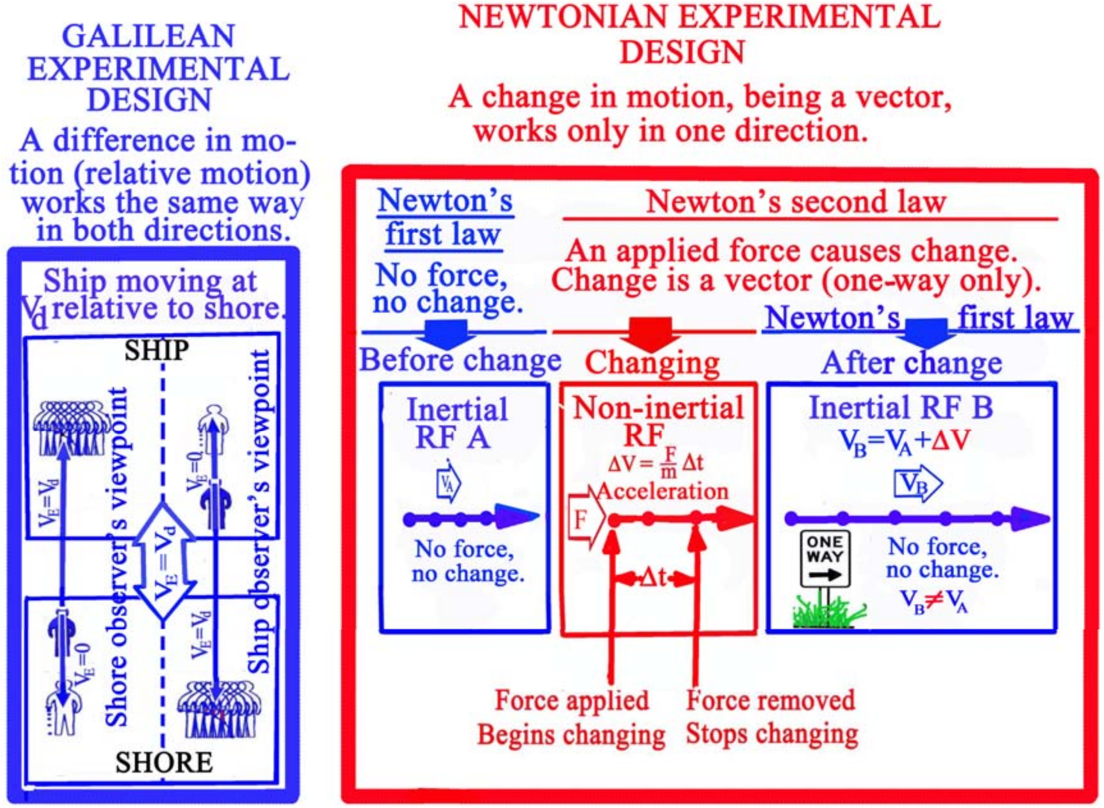
**STEP 5.**

**Neither the Galilean design nor the Newtonian design supports a direct comparison between how Newton's laws treat changes in motion, from one inertial reference frame to another, with how Galileo's relativity principle treats the resulting differences in motion, created by those changes, between the same inertial reference frames.**

**That comparison can be made only by integrating the Galilean and Newtonian experimental designs into an integrated Galilean/Newtonian design (abbreviated as the G/N design).**

# THE GALILEAN/NEWTONIAN EXPERIMENTAL DESIGN

The G/N design combines the Galilean and Newtonian designs to compare how Newton's laws treat a change in motion with how Galileo's relativity principle treats the resulting difference in motion between the same two inertial reference frames. The pre-combination building blocks are:



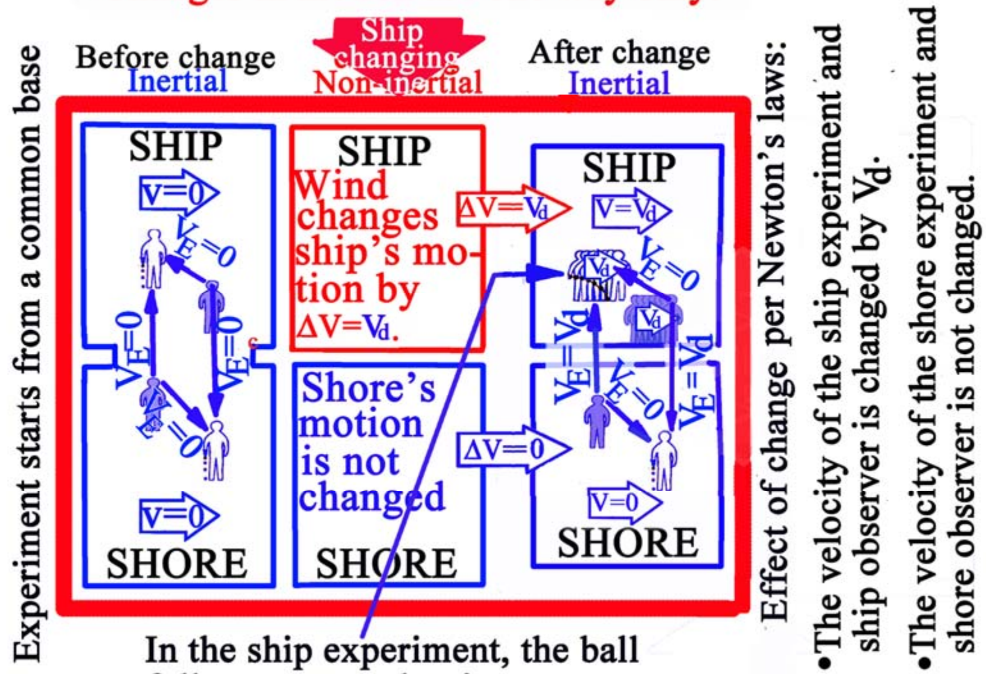
## GALILEAN/NEWTONIAN EXPERIMENTAL DESIGN

Begin with the Newtonian Domain of the G/N design to show how Newton's laws determine the effects of changing the ship's motion from being stationary at the shore to moving at $V_d$ relative to the shore.

### NEWTONIAN DOMAIN

Effect of changing ship's motion by $V_d$

Changes in motion are one way only.




In the ship experiment, the ball follows a curved trajectory. According to Newton's laws, the experimental result is changed.

## GALILEAN/NEWTONIAN EXPERIMENTAL DESIGN

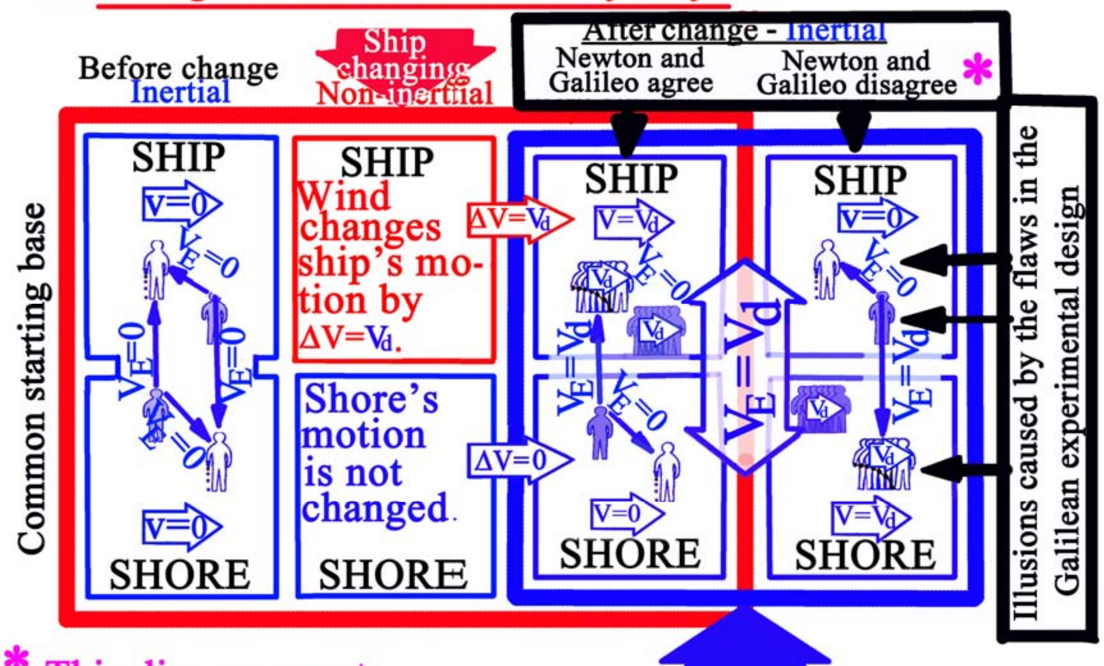
**ADD GALILEAN DOMAIN**

**Shows how Galilean design interprets the change in the ship's motion.**

**NEWTONIAN DOMAIN**

**Effect of changing ship's motion by $V_d$**

**Changes in motion are one way only.**




* This disagreement renders the first postulate of relativity invalid.

**GALILEAN DOMAIN**

**A difference in motion (relative motion) works the same way in both directions.**

# Step 6.

# The two fatal flaws in the Galilean Experimental design and how they have hidden the conflict between Newton's laws and Galileo's relativity principle from discovery for more than a century.

# THE TWO FATAL FLAWS IN THE GALILEAN EXPERIMENTAL DESIGN

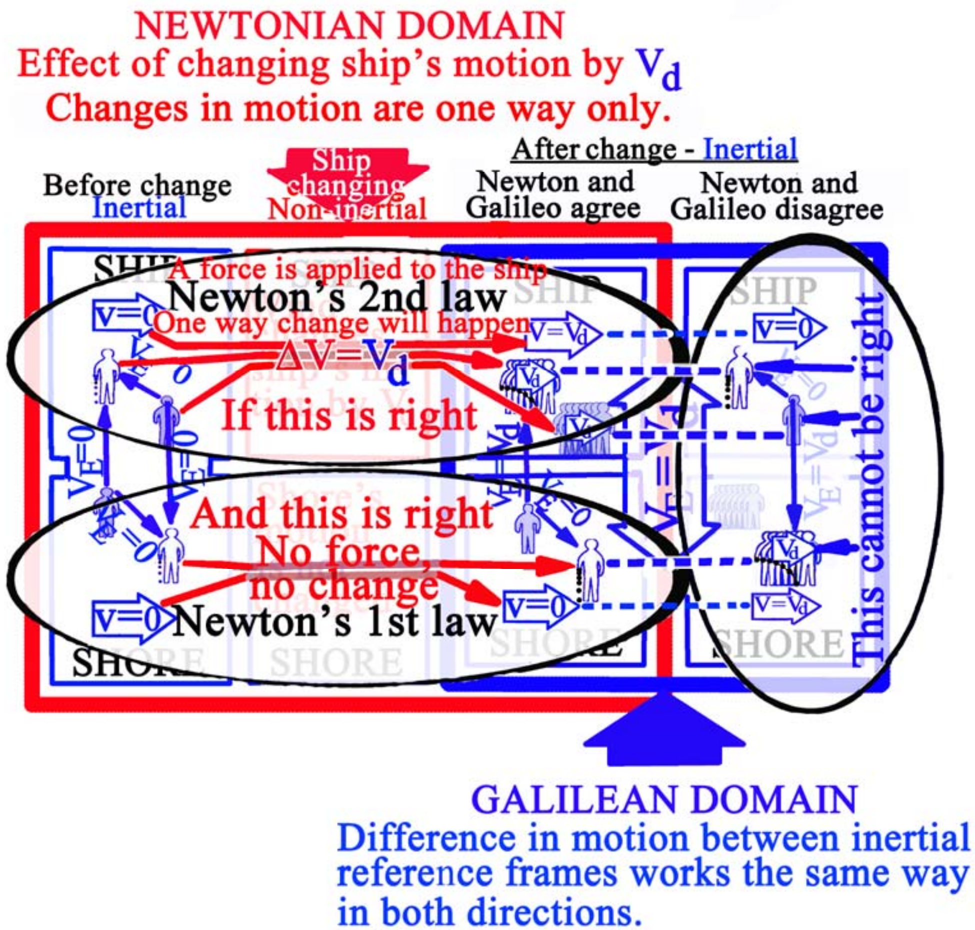
1. According to the relativity principle, itself, an observer in inertial motion has not a clue as to either the speed or direction of his own motion. He will feel motionless and any experiment he conducts will produce the same result in every inertial reference frame.* Thus, he will be clueless as to both the speed and direction of his own motion and that of whatever he observes. Clearly, an observer in an inertial reference frame is information challenged.

2. Changes in motion take place in non-inertial reference frames. There are no non-inertial reference frames in the Galilean experimental design. Thus, it is structurally incapable of addressing the question as to whether or not Newton's laws will produce changes in motion which agree with how Galileo's relativity principle treats the differences in motion (a.k.a. relative motion) created by those changes.

* Goldsmith, *Einstein: A Relative History*, 67-70.

## GALILEAN/NEWTONIAN EXPERIMENTAL DESIGN

**ΔV is a vector. It can't cause a two way change in motion.**



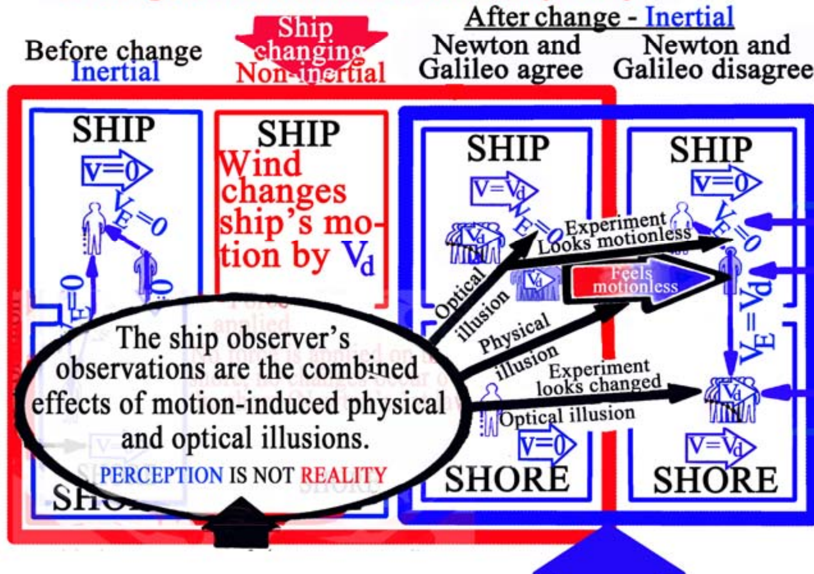
## THE TWO FATAL FLAWS IN THE GALILEAN EXPERIMENTAL DESIGN AT WORK

How the fatal flaws in the Galilean experimental design cause the ship observer's misperceptions of how he feels and what he sees.

**NEWTONIAN DOMAIN**

**Effect of changing ship's motion by $V_d$**

**Changes in motion are one way only.**




**GALILEAN DOMAIN**

**Difference in motion between inertial reference frames works the same way in both directions.**

**Being in inertial motion, the ship observer feels motionless and interprets the experimental results as he sees them.**

**PERCEPTION IS NOT REALITY**

**The Galilean relativity principle is a principle of observation not a principle of motion.**

**All it can tell you is what will be observed (a.k.a. perceived) when an observer's or experiment's motion is changed from one inertial reference frame to another. The Galilean experimental design, upon which the relativity principle is based, has no non-inertial reference frame. Thus, It has no means by which it can determine what Newton's laws say will happen as a result of the change in their motion.**

**Perception is not reality.**

## STEP 7.

**How the integrated design reveals that, contrary to the first postulate's assumed conformity, Newton's laws and Galileo's relativity principle are different in kind.**

**They address different aspects of motion having different causes and different effects.**

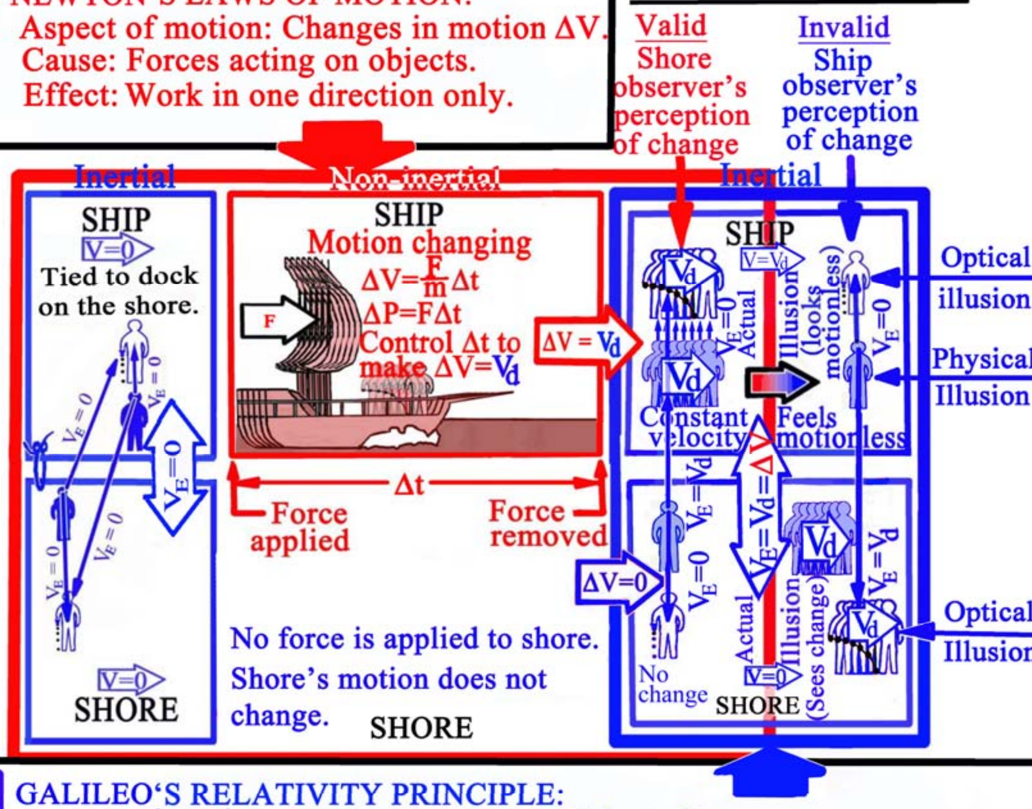
## NEWTON'S LAWS AND GALILEO'S RELATIVITY PRINCIPLE

## ARE DIFFERENT IN KIND

They address different aspects of motion which have different causes and different effects.

This design shows which observations are valid and which are not.

**NEWTON'S LAWS OF MOTION:**
Aspect of motion: Changes in motion $\Delta V$.
Cause: Forces acting on objects.
Effect: Work in one direction only.




On the ship, the inertial motion of the experiment and observer changed by the same amount. The ship observer feels motionless and $V_E=0$. Thus he feels the same and sees the same as before. However, thinking that he is motionless, he thinks that the shore experiment changed its motion.

**GALILEO'S RELATIVITY PRINCIPLE:**
Aspect of motion: Observed experimental result.
Cause: Determined by the difference in motion $V_E$ between the reference frame of the observer and that of the experiment he observes.
Effect: Such differences work the same way in both directions.

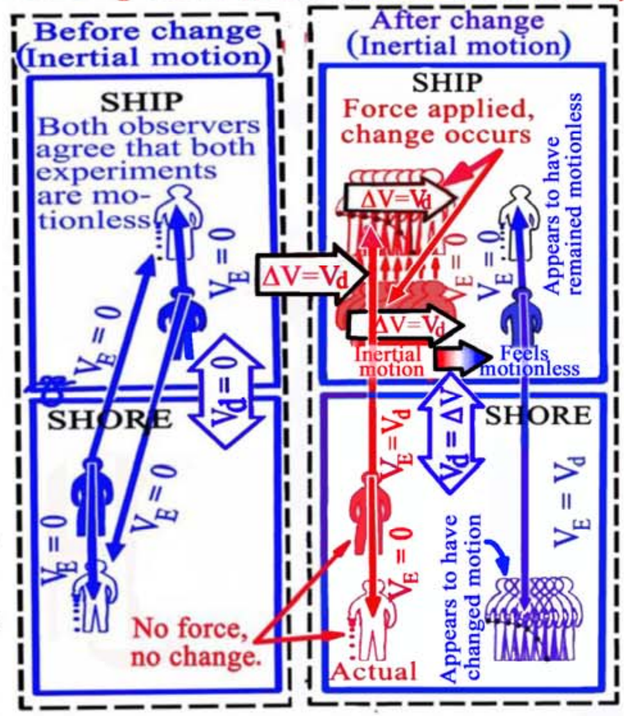
## STEP 8.

**How the G/N design reveals that each observer's definition of motion is entirely subjective and is different in every different inertial reference frame.**

EACH OBSERVER'S DEFINITION OF MOTION IS SUBJECTIVE AND IS DETERMINED BY HIS OWN STATE OF MOTION

(Effects of changing ship's motion per Newton are shown in red.)

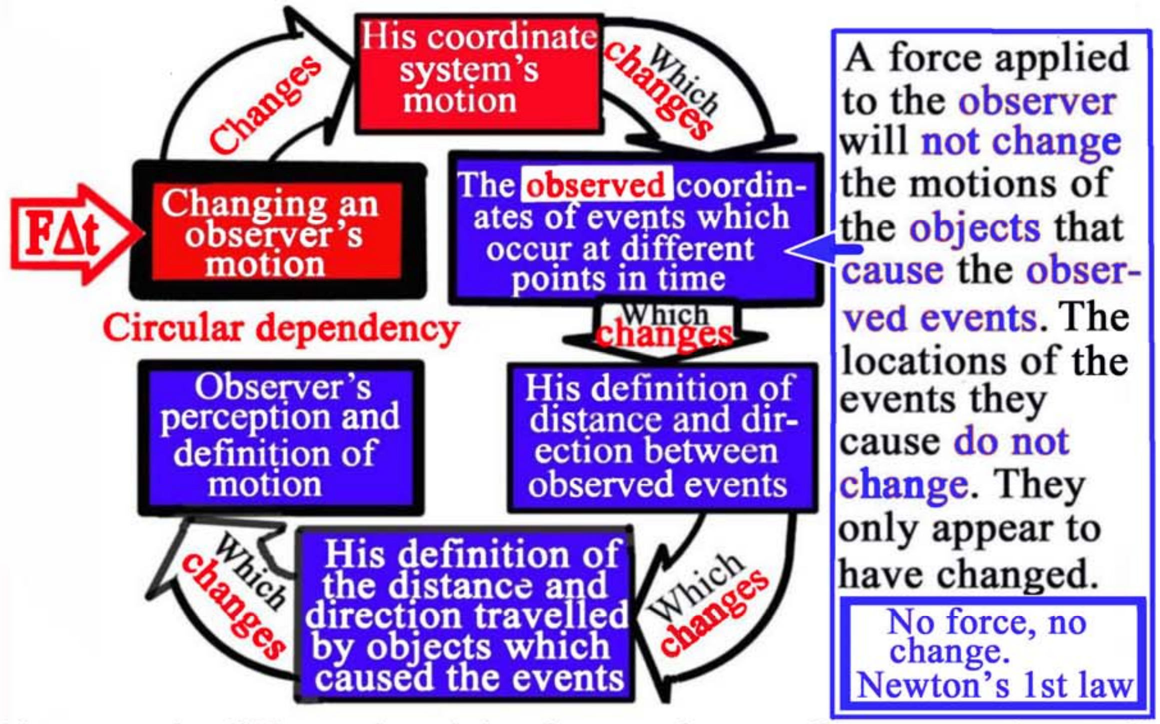
1. Before the ship's velocity is changed, both observers agree that both experiments are motionless.
2. After the ship's velocity is changed, the shore observer correctly perceives the change in the ship experiment's result and the absence of change in the shore experiment's result.
3. The ship observer fails to perceive the change in the ship experiment's result and perceives a change in the shore experiment's result which did not happen.




WHY DOES THAT HAPPEN?

Before the ship's motion was changed, the ship observer defined motionless as not moving relative to the dock. After the change, he defines motionless as moving at $V_d$ relative to the dock. <u>Changing his definition of motionless changes his definition of motion.</u>

EVERY OBSERVER'S DEFINITION OF MOTION IS TOTALLY SUBJECTIVE AND IS DETERMINED BY HIS PERSONAL STATE OF MOTION.




Observers in different inertial reference frames disagree on the motions of the same celestial bodies not because their motions are different in each observer's reference frame but because each observer has a different perception and definition of motion. There are no multiple universes. What there are is as many different definitions of motion as there are inertial reference frames. PERCEPTION IS NOT REALITY.

# CONCLUSIONS:

## CONCLUSIONS

Newton's laws of motion and Galileo's relativity principle are different in kind.

Newton's laws deal with physical changes in motion ($\Delta V$) which are caused by forces and operate only in one direction.

Galileo's relativity principle deals with observations of experimental results which are determined by the observer's motion relative to that of the experiment ($V_E$) and which work the same way in both directions between any two inertial reference frames.

They deal with different aspects of motion having different causes and different effects.

# CONCLUSIONS

Contrary to what is assumed in generally accepted theory, Newton's laws and Galileo's relativity principle do not agree.

Newton's laws say that when an experiment's velocity is changed the experimental result will change. Galileo's relativity principle says that an observer who accompanies the experiment will feel the same and will see the same experimental result as he did before the change, regardless of the magnitude of the change.

However, it isn't the experimental results which stay the same; it is the collocated observer's observations. And his observations are caused by the very same changes in motion with which they disagree (a result of the two fatal flaws of observations made in inertial reference frames).

# CONCLUSIONS

**Because Newton's laws of motion do not and cannot conform to Galileo's relativity principle, the first postulate of relativity is invalid.**

**Because the first postulate of relativity is invalid, the special theory of relativity is invalid.**

**Because the special theory of relativity is invalid, the general theory's validity is, at best, questionable.**

**Because the special theory is invalid there is no theoretical basis for string theory.**

## NEWTON'S LAWS OF MOTION AND THE INNATE LIMITS OF THE GALILEAN EXPERIMENTAL DESIGN CONFIRM THE EXISTENCE OF MAXWELL'S UNIQUE INERTIAL REFERENCE FRAME.

Newton's laws disclose that:

- Changing an experiment's velocity from that of one inertial reference frame to that of another will change the experimental result (e.g. a dropped ball will follow a different trajectory).
- Thus, an experiment's result will be different in every different inertial reference frame.

The innate limitations of the Galilean experimental design disclose that:

- An observer in inertial motion has no means by which he can determine either his speed or direction of travel.
- His own, personal state of motion determines his own, personal definition of motion. Thus, how he defines motion will be different in every different inertial reference frame. The same limitation will apply to motion-detecting scientific apparatus.

It follows that, according to generally accepted theory as to Newton's laws and as to the information available to the occupants of inertial reference frames, there can be only one, unique, inertial reference frame in which and from which an object's motion will be correctly observed.

# CONCLUSIONS

## THE ROLE PLAYED BY CIRCULAR REASONING IN HIDING THE FIRST POSTULATE'S FLAW

Einstein's first postulate of relativity is a declaration that Newton's laws of motion apply to all phenomena involving motion and the results they produce will conform to Galileo's relativity principle without any need for adjustments such as those defined by Maxwell.*

However, and perhaps ironically, the special theory **then adjusts** the parameters of the equations of Newton's laws (i.e., the properties of time, space and mass) as variables whose values in a given inertial reference frame are determined by its motion relative to the frame of reference of its observer.**

* Giancoli. *Physics*. 745-750.

** Ibid., 753-755, 758-759, 761, 991-994. Goldsmith, *Einstein, A Relative History*, 73.

# CONCLUSIONS

Given the above, it should be no surprise that the special theory has been consistently validated by "empirical observations" for more than a century. Surprise would be warranted only if it had not.

What is astonishing is that no one has recognized that the theory's adjustments of time, space* and mass are as much adjustments of Newton's laws as were the additional terms Maxwell added for the same purpose. One cannot observe the motions of objects with accuracy except from the vantage point of a specific inertial reference frame. And Maxwell's research demonstrated how to identify that reference frame. It is the one in which an observer will correctly measure the speed of light.

One should take care not to place too much faith in the belief that consistent validation of the special theory has been caused by the relativistic properties of time, space and mass rather than by the special theory's relativistic adjustments of their values, as parameters in Newton's equations, to make them conform to the relativity principle, thereby fulfilling the first postulate, thereby "proving" that the first postulate and the theory it created are valid.

Can you say "Self-proving exercise in circular reasoning"?

* Changing the dimensions of space changes the values of distance parameters in the equations of Newton's laws.

# CONCLUSIONS
## There are two ways to skin a cat.

There are two ways to deal with the genuine difference in kind between Newton's laws of motion and Galileo's relativity principle. One is to correct observations (a.k.a. perceptions) for the motion-induced observation error experienced by observers who are in different inertial reference frames from the one in which observations are correct. This is the treatment shown to be necessary in Maxwell's research.* The other way is to make relativistic adjustments to the parameters of the equations of Newton's laws (i.e., the properties of time, space and mass) to explain away the genuine difference between them.

Maxwell's method corrects perceptions to discern reality. Ironically, Einstein's method has the effect of adjusting reality to match perception (thereby leading us down the rabbit hole into Wonderland).

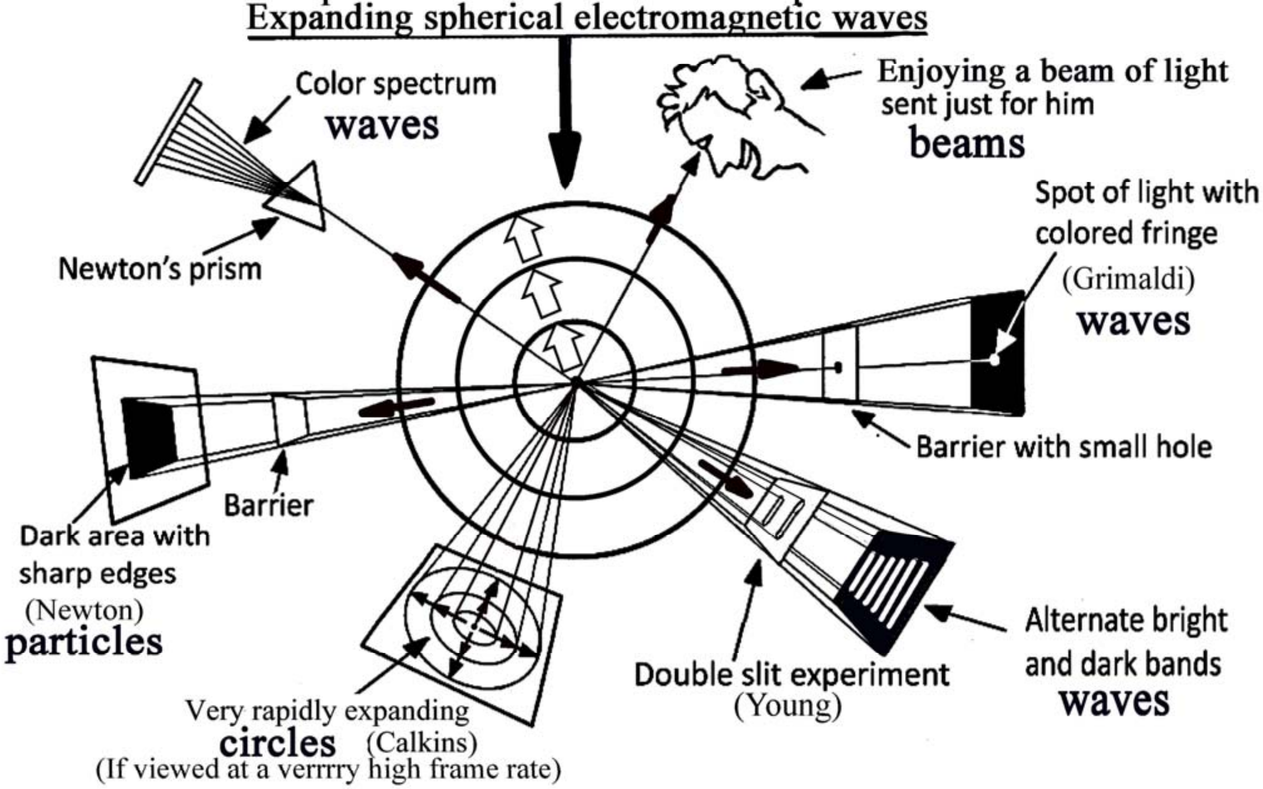
Of the two, Maxwell's method is the better.

* Giancoli, *Physics,* 745-746.

A PARTING COMMENT ON THE IMPORTANCE OF EXPERIMENTAL DESIGN

What you see is determined as much by how you look for it as by what is there to be observed. For example, the belief that light has many different characteristics ...

**One phenomenon. Four different interpretations.**




From Relativity Revisited, Chapter 3, A Treatise on the Ambiguity of Waves. © 2011 Richard O. Calkins

## SOME THOUGHTS ON THE PERILS OF INTERPRETING OBSERVATIONS OBTAINED FROM EXPERIMENTS USING THE WRONG EXPERIMENTAL DESIGN:

"Perception is not reality"

Anonymous

"We all know that perception is not reality until we run into 'We saw it with our own eyes!' "

Richard O. Calkins, 2018

"Things must be learned only to be unlearned again, or more likely to be corrected."

Richard Feynman, 1963

"Science progresses more rapidly when accepted with reasonable doubt than when treated as beyond doubt."

Richard O. Calkins, 2019

# THE END

## Of being
## RELATIVELY LOST IN RELATIVITY

# THE END

# OF RELATIVITY

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