ABSOLUTELY LOST IN RELATIVITY

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

A CAUTIONARY TALE ...

What we can learn from an experiment is determined by what the experimental design is capable of telling us.

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

Every experiment produces observations. But observations are meaningless until we interpret them. And whether those observations provide enough information to correctly interpret them is not just unknown, it is unknowable.

There is no way to determine the significance of what is not disclosed.

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

INTRODUCTION

Einstein's special theory of relativity addresses the nature of inertial motion. Based on the work of Galileo Galilei and Isaac Newton, Einstein's special theory is founded on the premise that motion can be defined only relative to the frame of reference from which it is observed and measured.

The conceptual foundation of relativity theory is expressed in Einstein's first postulate of relativity. It states that Newton's laws of motion will conform to Galileo's relativity principle, without need for adjustments of any kind, and that they apply to all phenomena involving motion, including the propagation of light.*

*** Douglas C. Giancoli, *Physics.* 4th Edition (Englewood Cliffs, New Jersey: Prentice Hall, 1995) 750. Goldsmith, Dr. Donald, and Robert Libbon, *Einstein: A Relative History* (New York: Simon & Schuster, Inc.., 2005), 70**

INTRODUCTION

Einstein's special theory has consistently been validated empirically for more than a century. It is considered the absolute, unquestionable gold standard of generally accepted theory.

However, despite that solid history of affirmation, it turns out that there is trouble in Relativity City

INDEED ... THERE IS BIG TROUBLE IN RELATIVITY CITY

There are two fatal flaws in the first postulate of relativity. They are:

- First - Newton's second law of motion is mathematically incompatible with Galileo's relativity principle.
- Second - Galileo's relativity principle is, itself, invalid.

HOW CAN THAT BE?!!

Because Galileo's relativity principle dealt exclusively with inertial motion, his experimental design used observers and experiments located in inertial reference frames. And because Einstein's special theory was based on Galileo's relativity principle and also focused exclusively on inertial motion, it has been accepted as eminently reasonable to use that same experimental design both to validate the special theory and to apply it in practice to the present day.* However, Newton's laws address both inertial (unchanging) motion and non-inertial (changing) motion. And apparently no one has considered moving experiments and observers from one inertial reference frame to another (an act of non-inertial motion) to see if the effect of such changes might produce experimental results that differed from Galileo's relativity principle.

As it happens, the analysis reported here does so and finds that the Galilean experimental design, itself, has flaws which have served both to produce and subsequently hide the first postulates flaws for more than a century.

* Giancoli, *Physics,* 743.

As discussed at the beginning of this report, the problem here is a matter of using an experimental design that fails to provide the information required to correctly interpret the observations it produces.

It is ironic that observations produced by the Galilean design, which are interpreted as identifying characteristics of inertial motion, actually identify flaws in the experimental design.

ANALYTICAL METHOD

This analysis draws entirely on generally accepted theory to disclose what the flaws are, how they were created and why they have remained hidden for more than a century. It is all a matter of experimental design.

The analysis begins with a brief history of the first postulate, including what is in it, how it got there and what generally accepted theory says it means.

It then describes what generally accepted theory says about the first postulate's component parts: Galileo's relativity principle and Newton's first two laws of motion.

It then does two things which have not been done before:

- First, it combines the Galilean and Newtonian experimental designs into a single integrated design. That allows directly comparing how Newton's laws treat changes in motion, from one inertial reference frame to another, with how Galileo's relativity principle treats the differences in in motion (a.k.a relative motion) caused by those changes.

- Second, the motions of experiments and their observers are changed from one inertial reference frame to another rather than merely having observers in inertial reference frames observe objects in inertial motion, as has been done consistently for more than a century.

ANALYTICAL METHOD
(CONTINUED)

The new information provided by these minor changes in methodology restore the reputations of Isaac Newton and James Clerk Maxwell to their pre-Einstein eminence. It also restores time, space and mass to their proper roles as constants of the universe. And it does away with multiple universes and other magical phenomena which have been based on the curious belief that motion is caused by perception.

And, most important of all, by replacing magical thinking with rationality, it returns physical science to the realm of science.

ESSENTIAL CONCEPTS WHICH ARE CENTRAL TO THIS ANALYSIS

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

These three 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.

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 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*, 20-21.

** Ibid., 743.

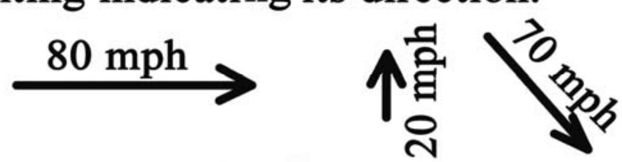
*** Ibid.

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. Speed and velocity are not interchangeable terms. 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, 48-50.

SUMMARY

- **Every inertial reference frame moves at its own specific speed in its own specific direction. In other words, it moves at and is defined by its own, unique velocity.**

- **Moving something from one inertial reference frame to another is simply a matter of changing its velocity.**

- **Changes in velocity take place in non-inertial reference frames.**

- **Changes in velocity are vectors. Vectors, having a specific direction, operate only in that one direction.**

A brief history of 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. The relativity principle states: *

   - 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. Thus, it will produce the same result.)

   - 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. Newton's first two laws state that:**

   - An object will remain in inertial motion unless an unopposed external (i.e., net) force is acting on it to compel it to change (First law).

   - A net force applied to an object for an interval of time will change its motion from one velocity to another (i.e., from one inertial reference frame to another). A change in velocity is a vector. It works only in one direction, namely that of the force which causes it (Second law).

* http://physicscentral.com/explore/plus/galilean-relativity.cfm

** Giancoli, *Physics*, 23-34, 76, 167 [Change in velocity (a.k.a. inertial motion) is derived from equation 7-2].

A BRIEF HISTORY OF EINSTEIN'S FIRST POSTULATE OF RELATIVITY

3. Because experiments involving the motion of physical objects produced the same results in every inertial reference frame, Newton's laws and Galileo's relativity principle were combined into what has been called the Newtonian relativity principle. And since results were the same in every inertial reference frame, none could be singled out as being more accurate than another. Thus, observations made in inertial reference frames all have equal merit. What is observed is what actually happens in that reference frame.*

4. James Clerk Maxwell solved the mysteries of electricity and magnetism in 1864. He found that light is an electromagnetic wave that transits empty space at precisely $3x10^8$ 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

** Ibid. 745-746.

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

5. Following numerous attempts to detect and analyze light's medium of propagation, in the 1880's A. A. Michelson and E. W. Morley proved that no medium of propagation for light existed. There was no explantion 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.

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 changes in motion (according to Newton's laws of motion) with how it treats the resulting differences in motion (according to Galileo's relativity principle) when the velocities of experiments or observers are changed to move them from one inertial reference frame to another.

We will begin the analysis with what generally accepted theory tells us about Galileo’s relativity principle:

AN EXAMPLE OF GALILEO'S OBSERVATIONS WHICH LED TO HIS RELATIVITY PRINCIPLE *

Terms: V_E - velocity of experiment relative to its observer.

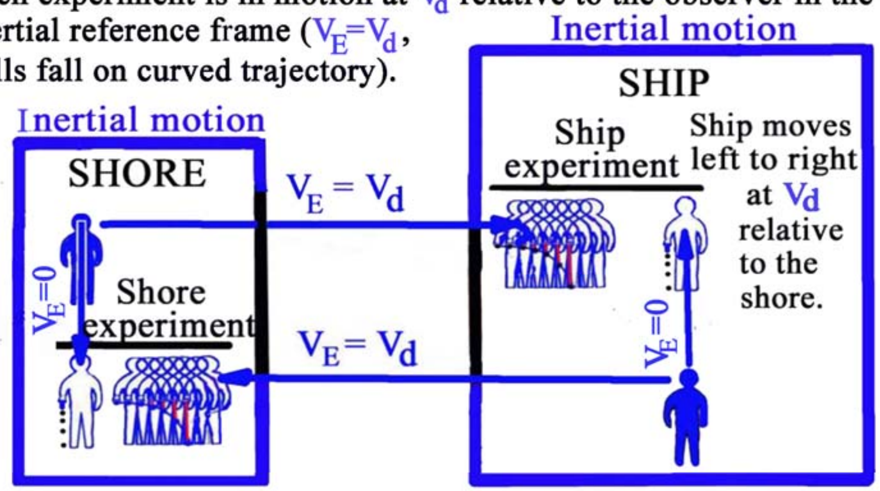
V_d - difference in velocity (relative motion) between ship and shore.

Experimental design: A ship is moving at V_d relative to the shore. On both the ship and the shore, there is an experimenter who drops a ball. An observer on the ship and one on the shore observe both experiments.

Observations:

Each experiment is motionless relative to the observer in the same inertial reference frame ($V_E=0$, the balls fall vertically).

Each experiment is in motion at V_d relative to the observer in the other inertial reference frame ($V_E=V_d$, balls fall on curved trajectory).

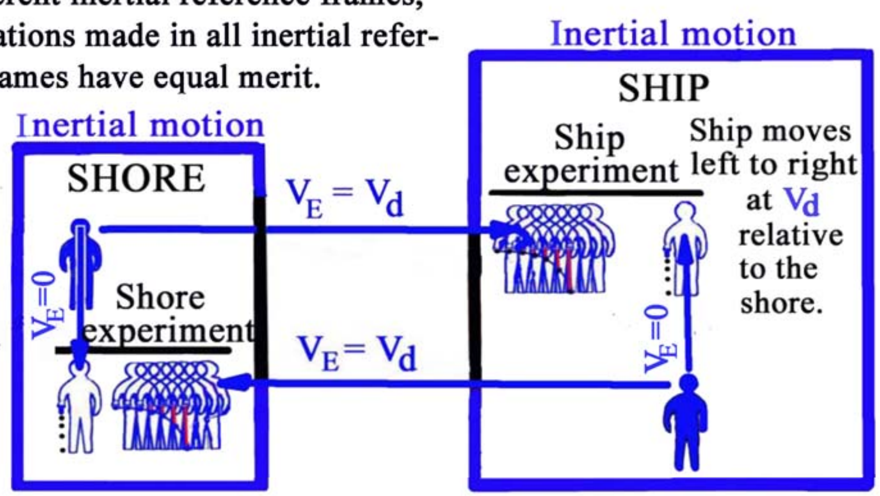


* University of California, Riverside (http://physics.ucr.edu/~wudka/Physics7/Notes_www/node47.html) Accessed April 10, 2017.
American Physics Society (http://physicscentral.com/explore/plus/galilean-relativity.cfm)

AN EXAMPLE OF GALILEO'S OBSERVATIONS WHICH LED TO HIS RELATIVITY PRINCIPLE *

INTERPRETATION OF OBSERVATIONS:

- Motion can be defined only relative to a defined frame of reference.
- An experiment will produce the same result in every inertial reference frame (i.e., when $V_E=0$).
- The relative motion between inertial reference frames has the same effect on an experimental results in both directions.(i.e., when $V_E=V_d$).
- Because there is no way to assess the relative merits of observations made in different inertial reference frames, observations made in all inertial reference frames have equal merit.



* 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)

What generally accepted theory says about Newton's first two laws of motion.

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. **When the force is removed, the object's motion will simply stop changing. Thus, it will be in a different inertial reference frame because it is moving at a different velocity.**

* 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 when a net force is applied to it for an interval of time is:

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

Terms shown in red are vectors.

Δv: Change in velocity	F: Net force applied to object (Compulsion to change)
Δt: The inerval of time that the force is applied	m: The object's mass (inertial resistance to change)

- 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.

Vectors only work in one direction.***

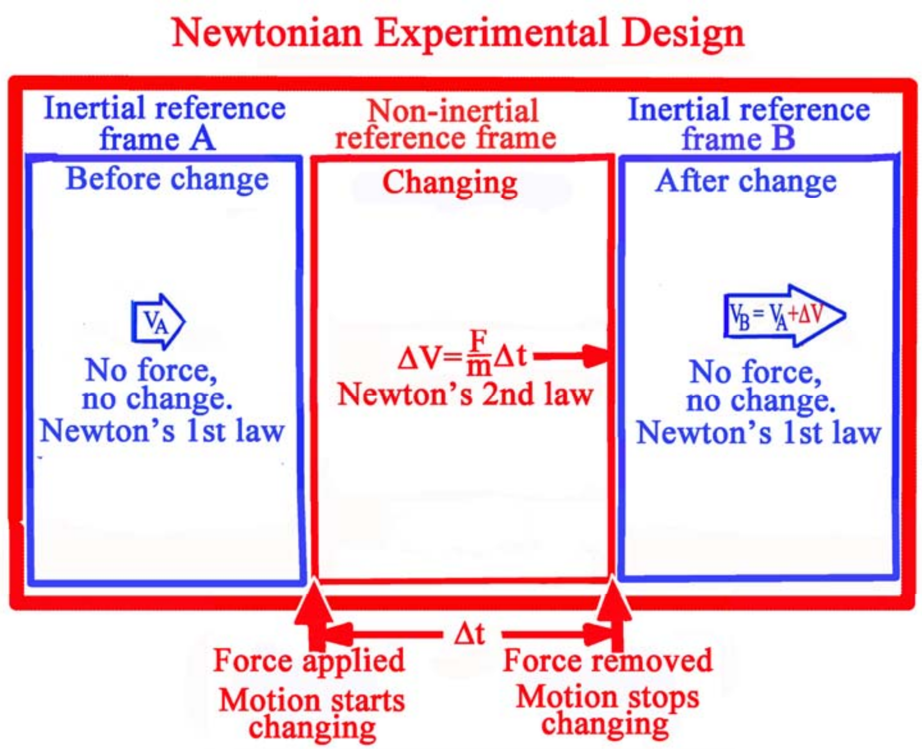
* Giancoli, *Physics,* 167, Equation 7-2.

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

*** Ibid., 23-24.

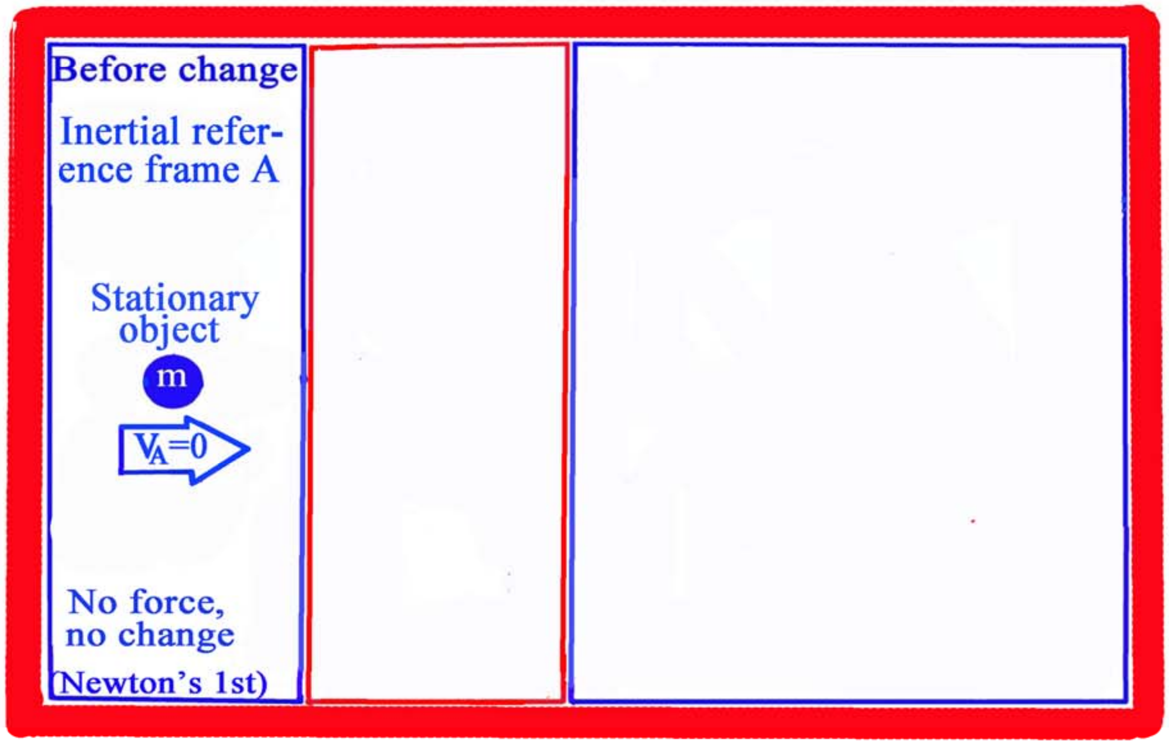
CONCEPTUAL DIAGRAM OF THE NEWTONIAN EXPERIMENTAL DESIGN

The Newtonian experimental design adds a non-inertial reference frame between the two inertial reference frames in the Galilean design to address the effects of changing an object's motion from one to the other.



USING THE NEWTONIAN EXPERIMENTAL DESIGN
TO ILLUSTRATE NEWTON'S FIRST TWO LAWS AT WORK.
Changes in motion are one-way only.

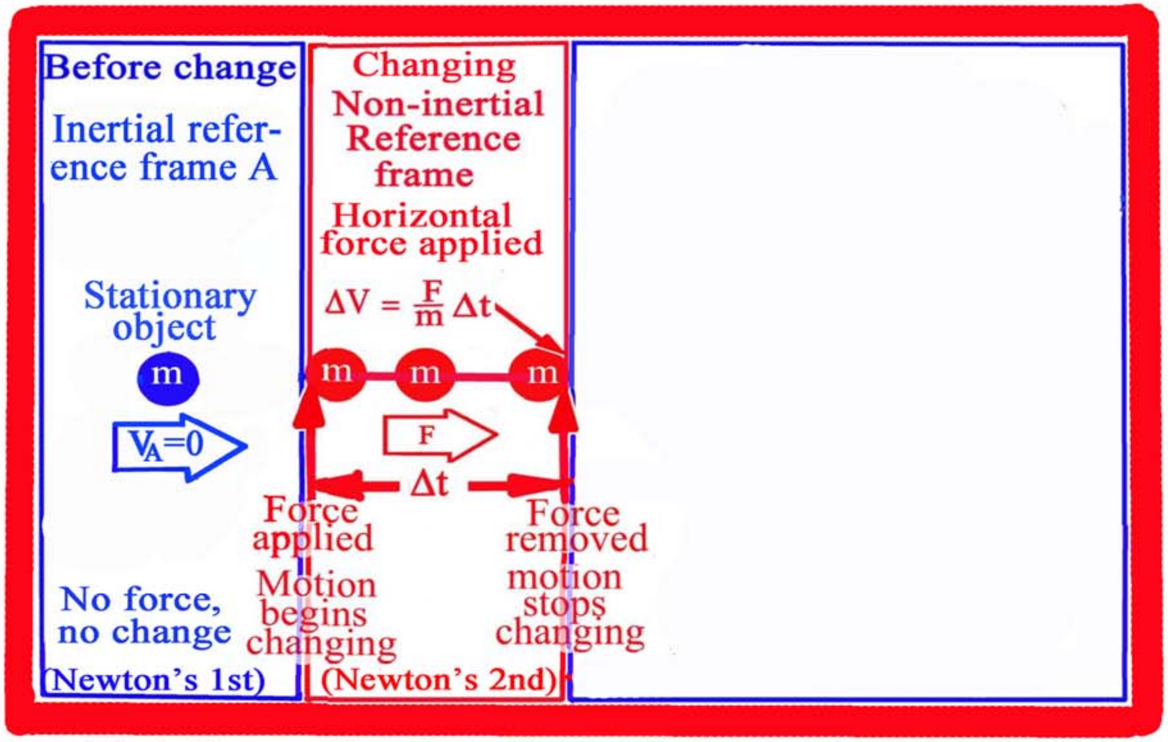
The ball's speed is indicated by how far it moves in each uniform interval of time.



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.

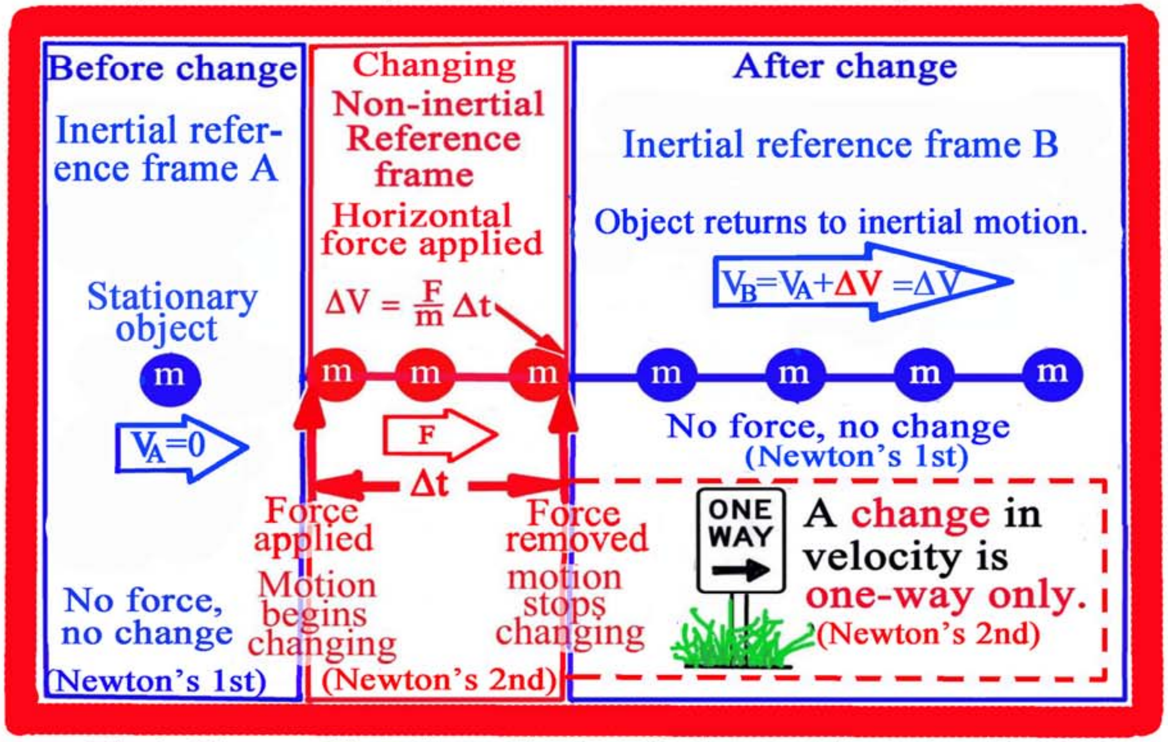


The ball's speed is indicated by how far it moves in each uniform interval of time.

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. When the force is removed, the object's motion stops changing. It becomes inertial again.



The ball's speed is indicated by how far it moves in each uniform interval of time.

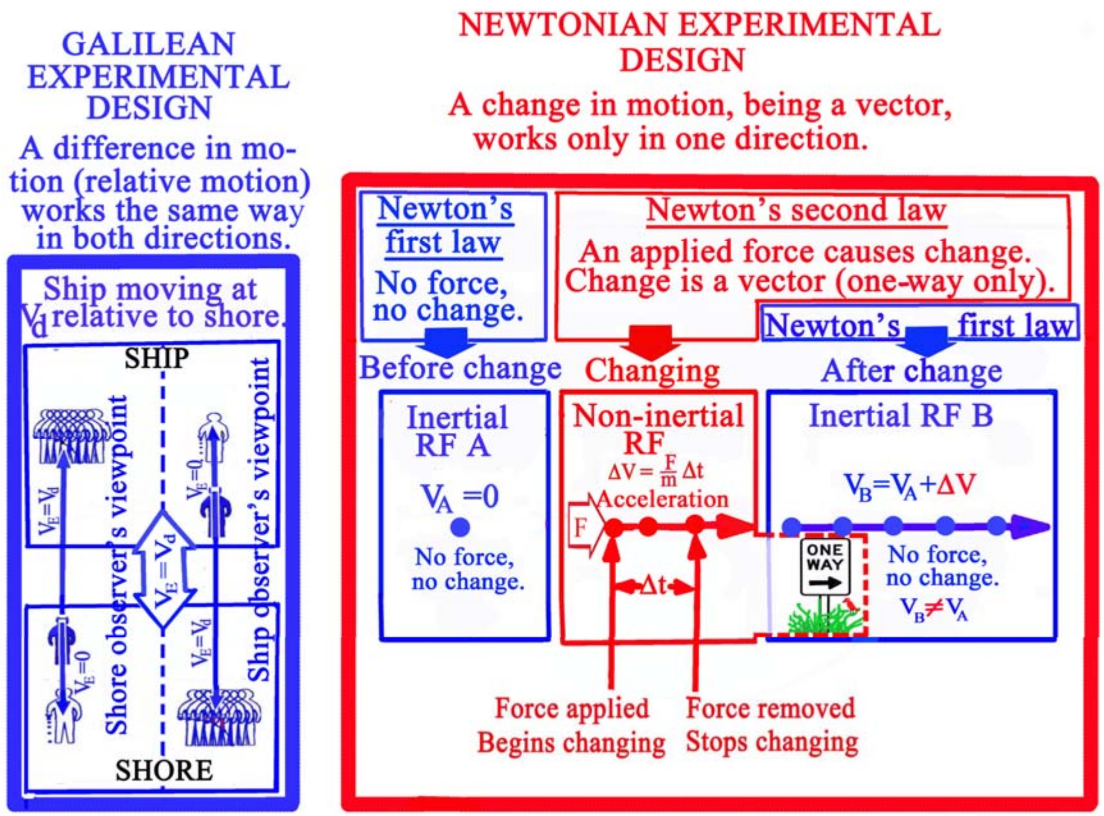
Using
the Galilean/Newtonian experimental design

To
Invite Newton to the table

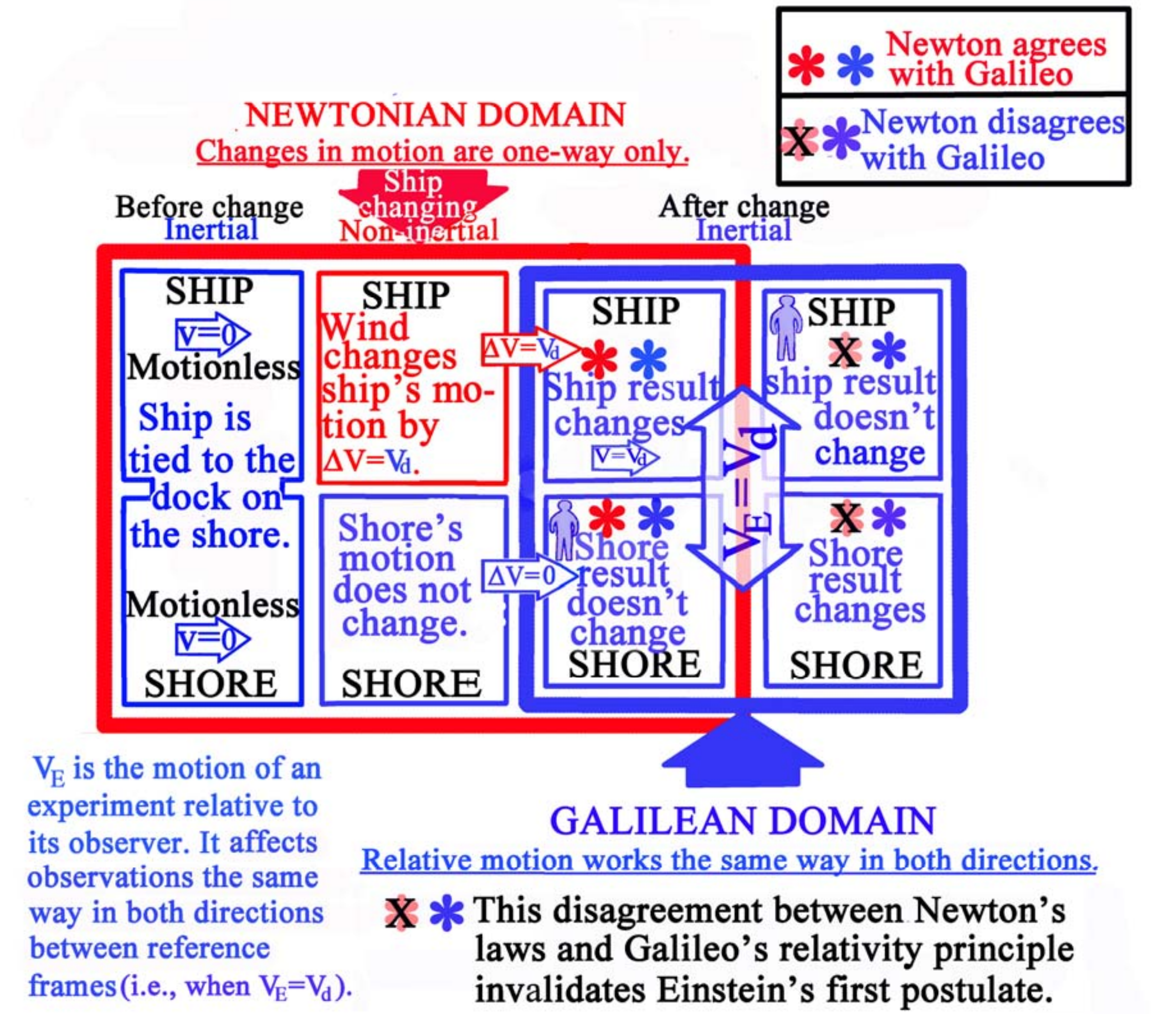
While redoing
the experiment used to illustrate Galileo's relativity principle

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:



CONCEPTUAL DIAGRAM OF G/N EXPERIMENTAL DESIGN



EXAMPLE OF G/N DESIGN AT WORK

The Newtonian domain of the G/N design shows how Newton's laws treat changing the <u>ship's</u> motion from at the shore to moving at V_d relative to it.

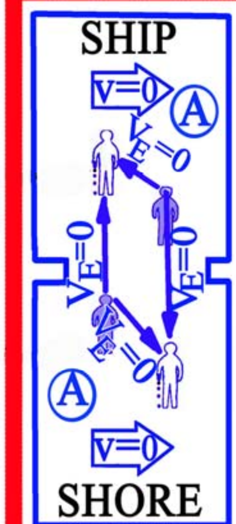
NEWTONIAN DOMAIN:
Effect of changing <u>ship's</u> motion by V_d
<u>Changes</u> in <u>motion</u> are one way only.

V_E=0 is seen as being motionless.

Ship changing
Non-inertial

Before change
Inertial

After change
Inertial



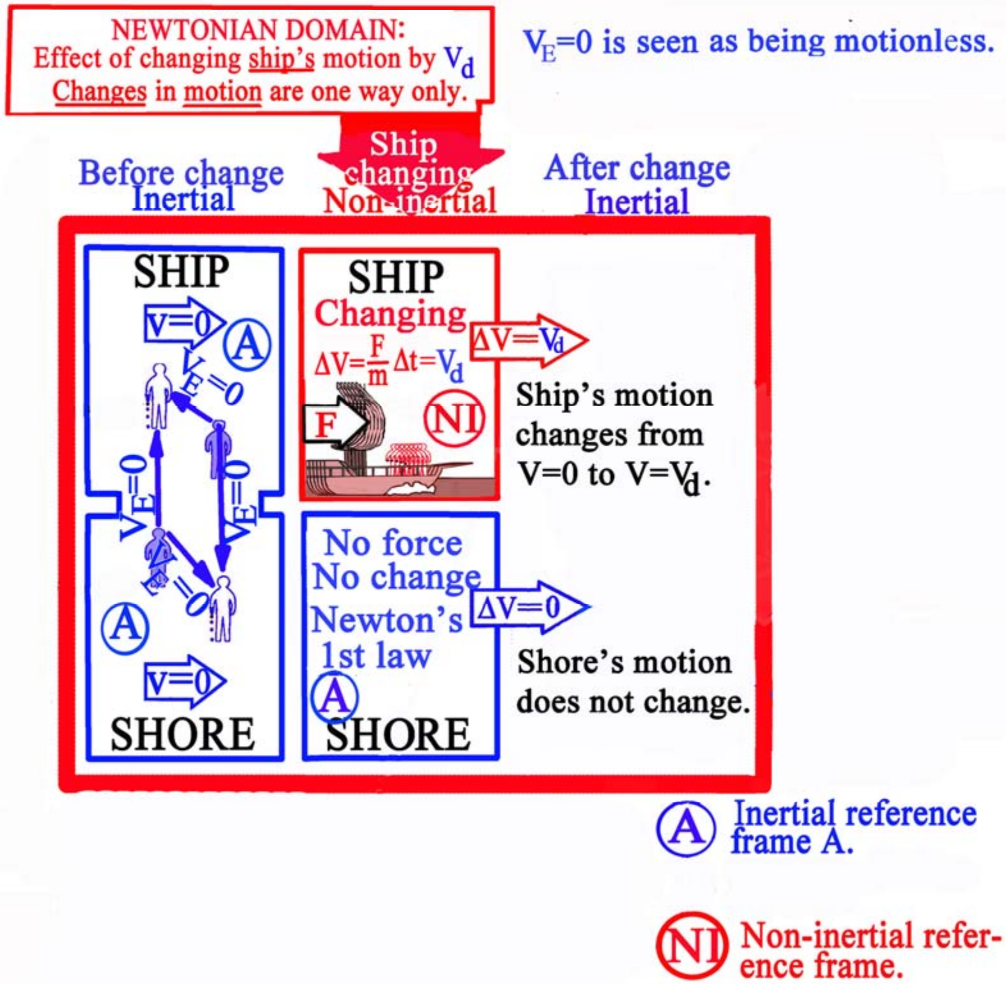
Experiment starts from a common base with the ship docked at the shore.

Both observers agree that both experiments are motionless.

(A) Inertial reference frame A.

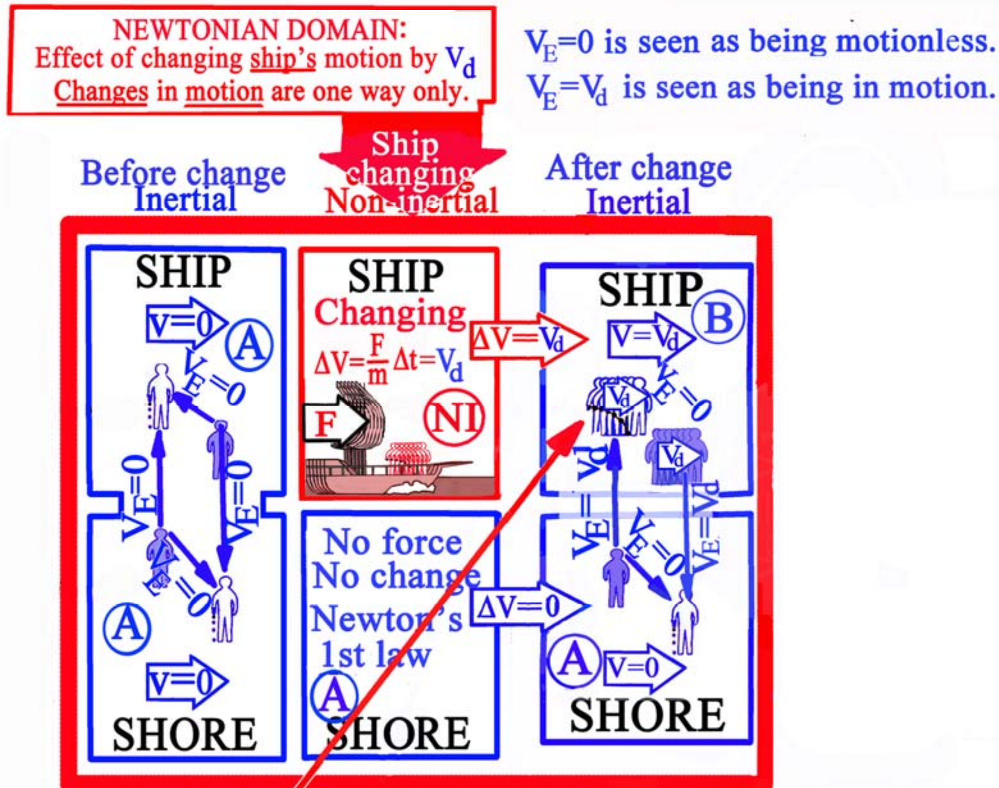
EXAMPLE OF G/N DESIGN AT WORK

The Newtonian domain of the G/N design shows how Newton's laws treat changing the ship's motion from at the shore to moving at V_d relative to it.



EXAMPLE OF G/N DESIGN AT WORK

The Newtonian domain of the G/N design shows how Newton's laws treat changing the ship's motion from at the shore to moving at V_d relative to it.



This physical change must occur for the shore observer to see what Galileo's relativity principle says he will. Thus, both agree that this change does physically occur.

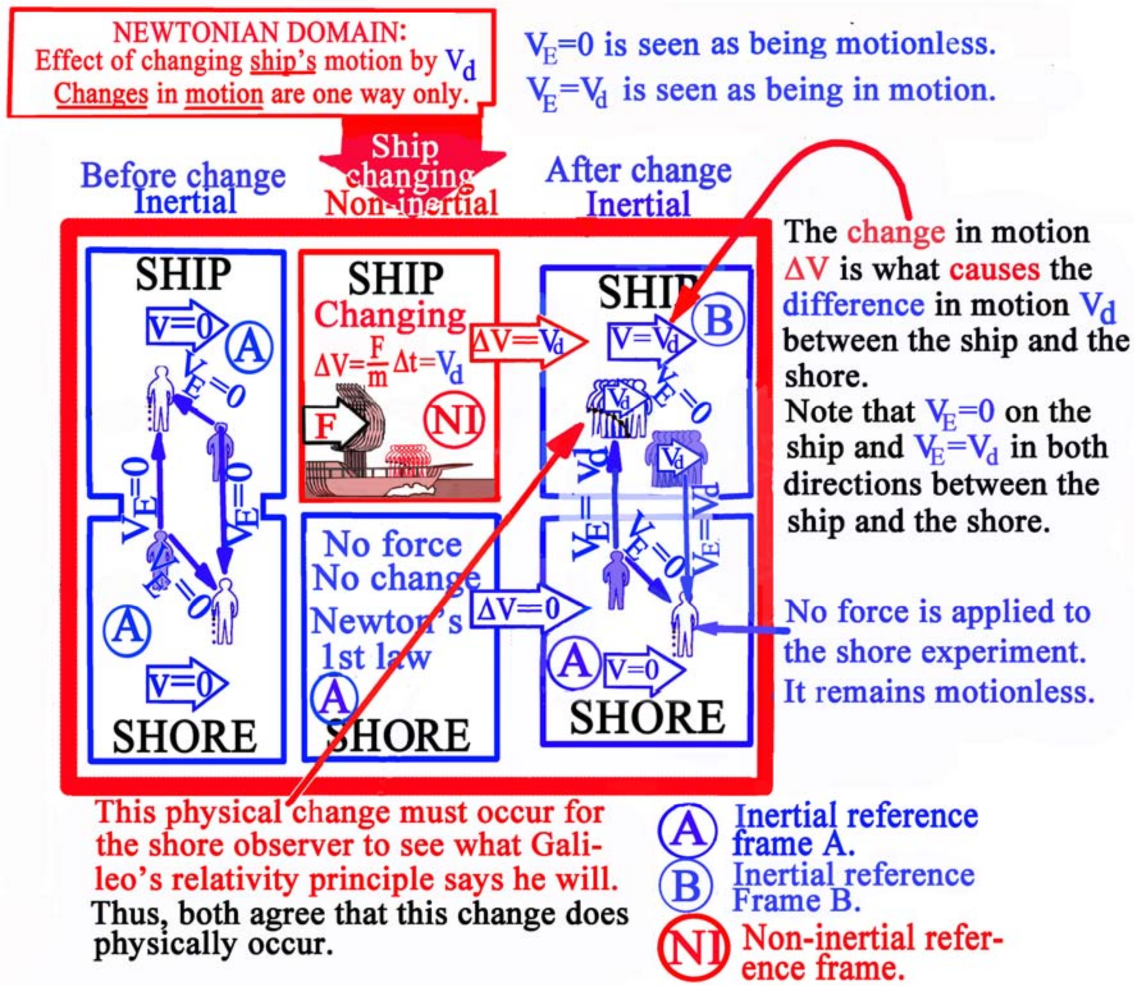
(A) Inertial reference frame A.

(B) Inertial reference Frame B.

(NI) Non-inertial reference frame.

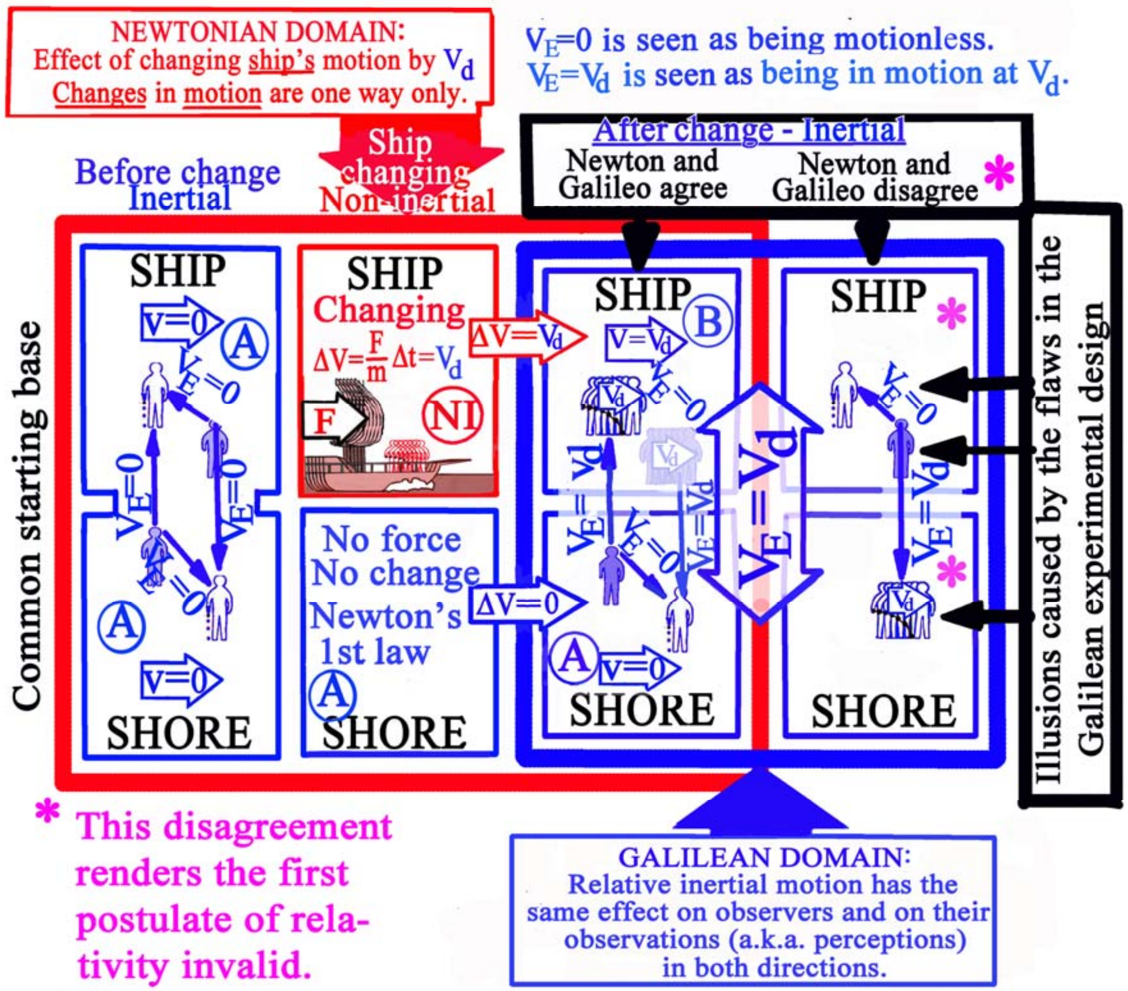
EXAMPLE OF G/N DESIGN AT WORK

The Newtonian domain of the G/N design shows how Newton's laws treat changing the ship's motion from at the shore to moving at V_d relative to it.



EXAMPLE OF G/N DESIGN AT WORK

ADD GALILEAN DOMAIN:
Shows how Galilean design interprets the change in the ship's motion.



Exposing the two fatal flaws in the Galilean experimental design

and

showing how they have hidden the conflict between Newton’s laws and Galileo’s principle from discovery for more than a century.

THE TWO FATAL FLAWS IN THE GALILEAN EXPERIMENTAL DESIGN

FIRST FATAL FLAW

In every inertial reference frame, an observer will feel motionless and any given experiment he conducts will produce the same result as if he were in any other inertial reference frame.* Thus, he will have no means by which he can discover the speed or direction in which he is traveling. All he can know is that they are not changing.

Not knowing his own speed or direction he will be equally clueless of the speed or direction of anything he observes, other than relative to himself.

Clearly, observers in inertial reference frames are clueless as to their own speed and direction and are equally clueless of the speed and direction of whatever they observe. And clueless observers are not renowned for making good observations.

This is the flaw in the Galilean design that prevents it from providing the information required to correctly interpret the observations it produces.

* Goldsmith, *Einstein: A Relative History*, 64-70.

THE TWO FATAL FLAWS IN THE GALILEAN EXPERIMENTAL DESIGN

SECOND FATAL FLAW

As previously discussed, both Galileo's relativity principle and Einstein's special theory deal exclusively with inertial motion. Thus, the experimental design Galileo used to create his relativity principle was used by Einstein to create his special theory and, subsequently, to validate and apply the special theory for more than a century. *

However, Newton's laws deal primarily with changes in motion, which take place in non-inertial reference frames. And there are no non-inertial reference frames in the Galilean experimental design. Thus, even though Newton and Galileo are equal partners in first postulate of relativity, Newton isn't even invited to be present when experiments are being conducted and interpreted.

This is the flaw in the Galilean experimental design which has hidden the disagreement between Newton's laws and Galileo's relativity principle for more than a century.

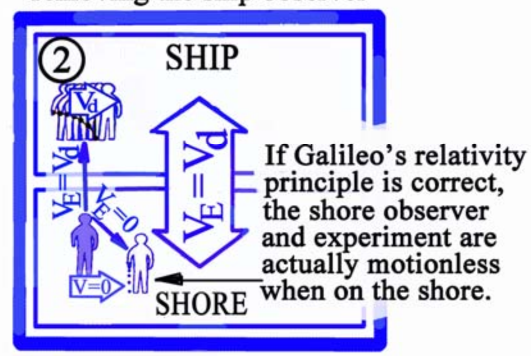
* Giancoli, *Physics, 743.*

HOW A FLAWED EXPERIMENTAL DESIGN PLUS "SEEING IS BELIEVING" CREATED A THEORY BASED ON MAGICAL THINKING

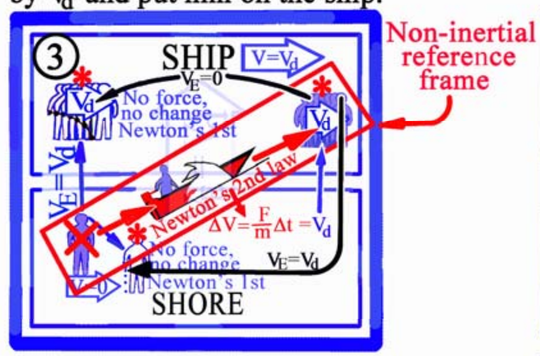
Definitions:
- Magical thinking: The belief that motion is caused by perception.
- Realistic thinking: the belief that motion is caused by forces interacting with the mass of physical objects.

Example of observations used by Galileo to produce relativity principle.

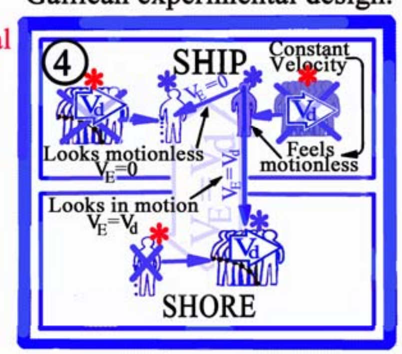
Simplify the analysis by removing the ship observer



Change shore observer's velocity by V_d and put him on the ship.



Observations produced by the Galilean experimental design.



*Actual motions after changing the shore observer's motion from being at the shore to being on the ship, as per Newton's laws.

*Perceived motions according to Galileo's relativity principle.

Newton and Galileo disagree on every observation (a.k.a. perception).

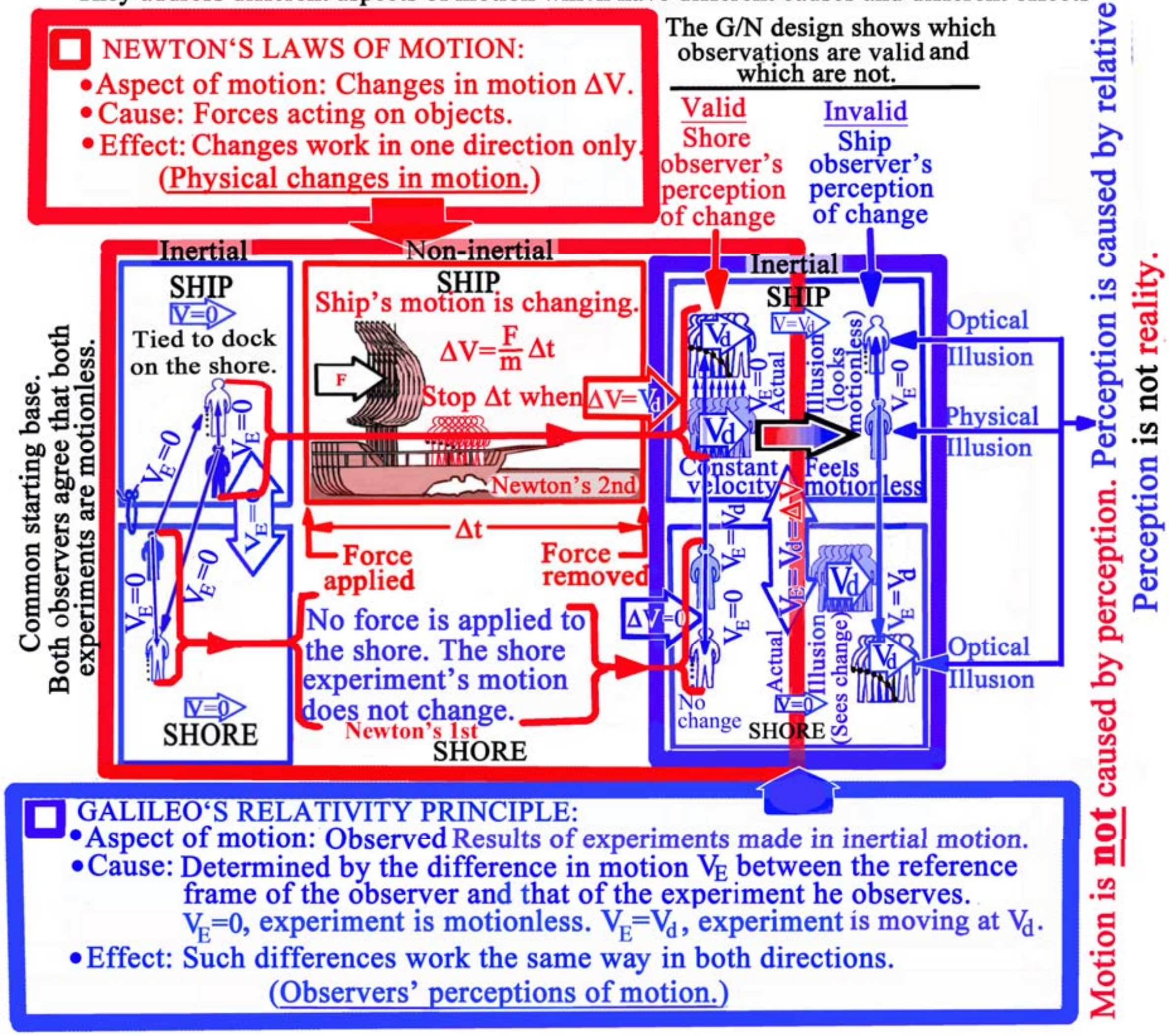
ANOTHER INSIGHT FROM THE GALILEAN/NEWTONIAN EXPERIMENTAL DESIGN!

The G/N experimental design reveals that, contrary to the first postulate's assumed conformity, Newton's laws and Galileo's relativity principle <u>are different in kind</u>.

They address <u>different aspects of motion</u> having <u>different causes</u> and <u>different effects</u>. That is why Newton's laws cannot conform to Galileo's relativity principle.

THE GALILEAN/NEWTONIAN DESIGN REVEALS THAT
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



OBSERVATIONS OF MOTION ARE COMPLETELY SUBJECTIVE AND ARE DETERMINED BY THE OBSERVER'S OWN, PERSONAL, STATE OF MOTION.

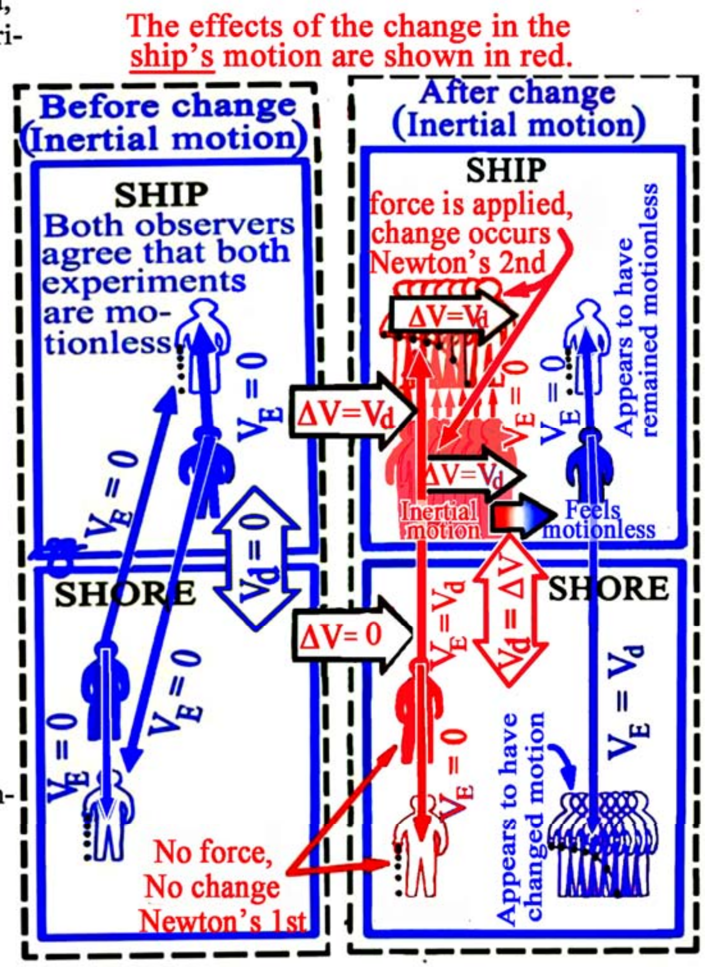
Before the ship's motion is changed, both observers agree that both experiments are motionless. The balls fall vertically.

After the ship's motion has been changed, the shore observer agrees with Newton's laws on the motion of both experiments. But the ship observer disagrees with Newton's laws on the motion of both experiments.

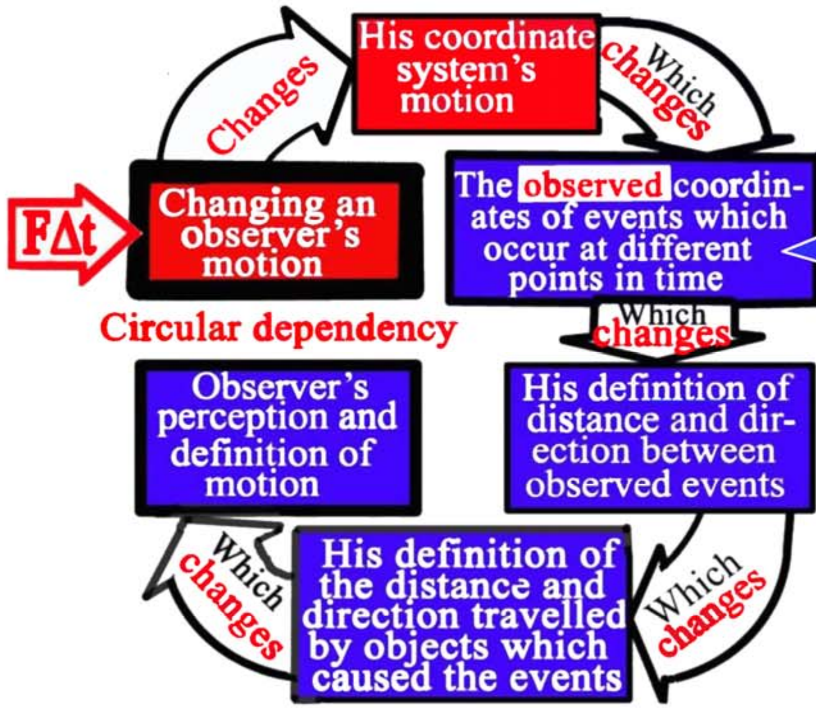
Why does that happen?

It happens because of the two fatal flaws in the experimental design used both to create the special theory and to validate and apply it for more than a century. Before the ship's motion was changed, the ship observer defined motionless as being stationary relative to the shore. After the ship's motion has been changed, he defines motionless as moving at V_d relative to the shore.

Changing his definition of motionless changes his definition of motion.



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



A force applied to the observer will not change the motions of the objects that cause the observed events. The locations of the events they cause do not change. They only appear to have changed.

No force, no change. Newton's 1st law

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:

CONCLUSION 1

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

Newton's laws deal with physical changes in motion (ΔV) 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 experiment's motion relative to that of the observer (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.

CONCLUSION 2

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 accompanying observer's observations. And his observations are caused by the same new conditions of inertial motion with which they disagree (a result of the two fatal flaws of observations made in inertial reference frames).

CONCLUSION 3
An incorrect experimental design can wreak havoc on scientific progress.

Because Newton's laws of motion and Galileo's relativity principle are different in kind, Newton's laws do not and cannot conform to Galileo's relativity principle. Accordingly, the first postulate of relativity is invalid.

Because the first postulate of relativity is invalid, the special theory of relativity is invalid. Our understanding of the universe is completely inaccurate.

Because the special theory of relativity is invalid, the general theory's validity is, at best, questionable. And it is based on the same error in logic as the special theory (gravity feels accelerative, is accelerative vs. inertial motion feels motionless, is motionless).

Because the special theory is invalid there is no theoretical basis for string theory.* It is all fuss and muss.

*** Lee Smolin, *The Trouble With Physics: The Rise of String Theory, The Fall of a Science, and What Comes Next* (Boston & New York, Houghton Mifflin Company, 2006) 223.**

CONCLUSION 4

THE G/N EXPERIMENTAL DESIGN INDEPENDENTLY VALIDATES MAXWELL'S SPECIAL REFERENCE FRAME AND SHOWS THAT IT APPLIES EVEN TO PHYSICAL OBJECTS MOVING AT EVERY DAY SPEEDS.

Newton's laws show that:

- Applying a force to an experiment to change its velocity from one inertial reference frame to another changes the experimental result (e.g., a dropped ball will follow a different trajectory).
- Thus, <u>an experiment's actual result will be different in every inertial reference frame.</u>

The Galilean relativity principle states that:

- In every inertial reference frame, an observer will <u>feel motionless</u> and will <u>see an experiement in that same reference frame as motionless.</u> Thus, the <u>observed</u> result always will be the same.

But by disclosing the two fatal flaws in Galileo's experimental design, the G/N experimental design shows that the observations are based on physical and optical illusions. Perception is not reality.

Since an experiment's actual result will be different in every inertial reference frame and observations will be the same, there can be only one inertial reference frame in which observations will match reality, even for physical objects moving at every-day speeds. And Maxwell has told us how to identify it.

CONCLUSION 5

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.

CONCLUSION 5
(Continued)

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 ironic is that no one has recognized Einstein's adjustments of time, space and mass, in the special theory, for what they are. They are simply another way than the one used by Maxwell to reconcile the genuine difference in kind between Newton's laws and Galileo's relativity principle. Maxwell used additional terms in his equations to accomplish that task. Einstein made relativistic adjustments to the parameters in the equations of Newton's laws to do it. But as you will find in Conclusion 6, that can have unintended consequences.

And 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 <u>relativistic properties</u> of time, space and mass rather than by the <u>special theory's relativistic adjustments of their values</u>, as parameters in Newton's equations, to make observations 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.

CONCLUSION 6

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.

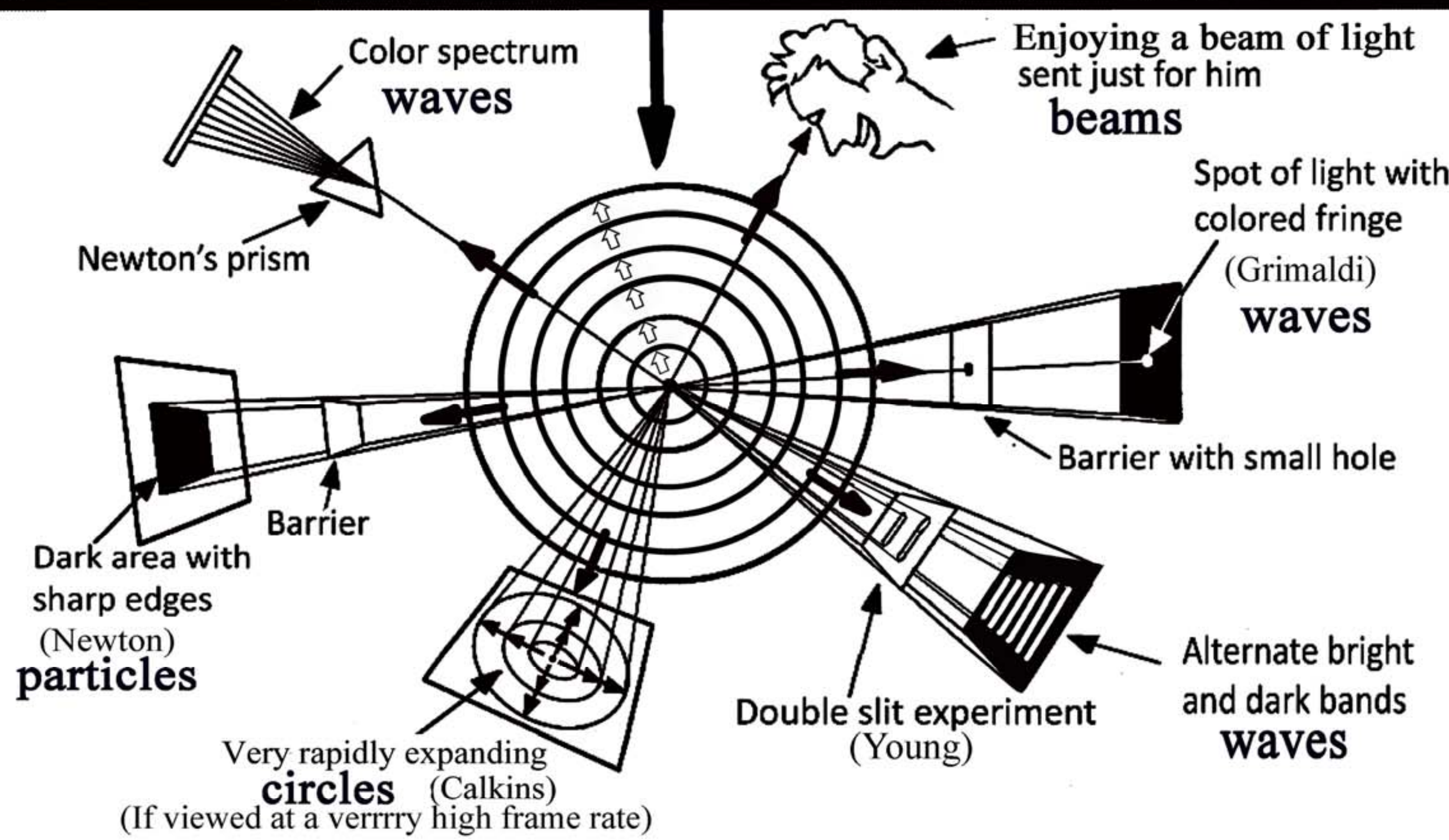
Maxwell's method corrects perceptions to discern reality. Ironically, Einstein's method has the effect of adjusting reality to match perception (thereby leading us down the rabbit hole into Wonderland).

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

* Giancoli, *Physics,* 745-746.

AN EXAMPLE OF THE IMPORTANCE OF EXPERIMENTAL DESIGN

What you see is determined by the experimental design you use to "observe" it.
Phenomenon being observed: Concentrically expanding spherical electromagnetic waves.
Six different experimental designs; four different interpretations of the phenomenon being observed. Only one gives a clue to the concentrically expanding spherical structure.



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
ABSOLUTELY LOST
IN
RELATIVITY

THE END

OF RELATIVITY

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