Rules of Nature

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This is the fourth paper in the New Electromagnetism series. Other Papers include: New Induction (ni.pdf), New Gravity (ng.pdf), and New Electromagnetism (ne.pdf). This material is copyright protected 1999-2003 and is solely the work/discovery of Robert J. Distinti.

Rules Of Nature

ABSTRACT

The goal of physics is to understand the mechanisms of nature. The knowledge of these mechanisms will enable mankind to better assess its role and position in the universe and provide a higher standard of living. Toward this goal, mathematics and other modeling tools are used to model man's interpretations of these underlying mechanisms.

One of mankind's impediments to understanding the mechanisms of nature is the very tools he uses to model these mechanisms. Or rather that mankind seems to forget that there are limitations in the medium in which these models have been developed. The limitations are often overlooked as these models are employed to derive or theorize about the existence of other natural phenomenon. These limitations sometimes lead to paradoxes or other perplexities. It is a purpose of this paper to provide a set of rules that a model must obey in order to be considered a viable description of a natural mechanism.

Another limitation that mankind imposes on itself is political in nature. Science will usually cling to the first model that produces experimentally accurate results (see our Galileo Example in section 2.14). From this first model, awards are given and university research money is granted. Whole communities of scientists will acquire their Ph.D. and spend their life's work using this first model. When a new model is discovered that threatens the well being of this group, things get ugly. It is a historical fact that science wastes years (sometimes centuries) resisting the change caused by newer models or methods. It will be the purpose of this paper to provide a set of rules to determine if a model properly describes a natural mechanism. If this set of rules were available in Faraday's time, it is possible that Faraday would have thrown out the model he discovered and eventually would have found the IEL (see "New Induction"). This could have saved a couple of centuries of wasted time.

Another problem with modeling techniques is abstractions. Mankind employs abstractions in order to simplify the visualization of and/or the teaching of difficult subjects. Abstractions, such as field lines, often take on a life of their own becoming, in the mind of scientists, an actual manifestation of nature. This provides a barrier to new ideas such as New Electromagnetism, which does not require the knowledge of fields in order to calculate cause and effect. This does not mean that fields do not exist; it means that field lines are only abstractions just like the longitude and latitude lines on a globe. They are useful; however, they do not exist. It is the ultimate goal the of the New Electromagnetism series to explore the true field mechanisms, which carry the forces of nature. It is a purpose of this paper to properly show the limitations imposed by abstractions.

Another problem with modeling techniques is loss of information due to simplifications and displaced equations. These are discussed in more detail in this paper.

This is the fourth paper in the New Electromagnetism series. The others "New Induction" (ni.pdf), "New Electromagnetism" (ne.pdf), and "New Gravity" (ng.pdf) are available at www.Distinti.com.

Table of Contents

1 Please Read.

The contents of this paper are protected by a number of schemes to include pending patents, trademarks, copyrights, and trade secrets. There is considerable research, publications and products based on the New Electromagnetism models which as yet have not been released. These items are to be released in phases over the next few years.

We publish a small portion of our research for free to allow those who are interested to judge the quality and value of our work. Our freely published papers may be duplicated and distributed without license as long as they are duplicated and distributed intact (all pages without changes).

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Rev1.2: Typographical/Grammar Fixes.
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Rev1.5: Changed "Please Read"; fixed grammatical error in abstract. New text in red
Rev1.6: Added Chapter: "Conservation of Energy: Panacea or Pitfall?"
Rev1.7: Added "The Anomaly Rule" and "The Correct Answer Rule"

Note1: Spelling/grammatical fixes are not highlighted since they do not represent new material.

2 Axioms and Definitions

The Rules of Nature are derived from the following set of Axioms and Definitions. These Axioms are a set of logical derivations to which I have struggled to maintain simplicity without jeopardizing the completeness of the arguments. In some cases more exhaustive arguments to some of the following axioms may be included in an appendix.

2.1 Definition: Anomaly

An anomaly is a mismatch between nature and a model. An anomaly can either be a natural phenomenon that the model predicts but is not seen in nature (for example see apoce.pdf – corner effects) or a natural mechanism that is not accounted for by mankind's models (such as the planets were in the old Earth centric model—see section 2.14).

When a model predict the outcome of an event but nature shows the opposite to be true, then this could be either called an anomaly or a paradox (see our Paradox generator)

2.2 Definition: Paradox

A paradox is a contradiction between models or a contradiction between a model and nature (which could also be called an anomaly). For more details see the Paradox Rule in section 2.9 .

2.3 The Time Travel Rule

The Time Travel Rule: If time travel in one direction is possible, then it is impossible in the other. Since the universe is in motion toward the future, time travel to the past is impossible. Nothing from the future can affect the past.

This section demonstrates that time travel, of the manner popularized by Sci-fi/Hollywood, is impossible. In science fiction time travel, the time traveler flicks a switch and travels backwards or forward in time. If science fiction time travel were possible, then it could only be achieved by one of the following two methods:

2.3.1 Method #1 – Time Sliding

All possibilities of the past coexist with the now—like the TV show Sliders. In such a system the traveler could step across a threshold to another permutation of the universe where the dinosaurs did not become extinct. If the traveler crossed the threshold and prevented his own birth, a new "time thread" would be spawned in which he did not exist. This new "time thread" would then coexists with the one from where he came. With this model we seem to have alleviated a paradox; however, we have created two larger paradoxes.

The first larger paradox rests with the fact that every new "time thread" that is spawned must contain an exact copy of the universe. For example, each time a set of dice is tossed, 36 copies of the universe are

created; one for each possible outcome. Where would all of this matter and energy come from? Further suppose that after the dice toss above, you went back in time and substituted a set of dice that only ever come up "snake eyes, " what then? Do all but one of the 36 universes that were created all of a sudden vanish? With this method of time travel it becomes possible to continually travel back in time to alter the number of "time threads" that spawn. This would be an infinite loop requiring infinite mass and energy.

The idea that copies of the universe are created for each outcome of a random event would require immense amounts of energy. Assume for a minute that there is infinite energy in the universe and that in fact 6 new "time threads" are created when I role a die. This still does not permit time travel with the "sliders" concept unless all past copies of a time thread are saved. When one travels back to a point in time, that person needs to stand on firm ground and manipulate "stuff" in order to cause a new thread to be spawned. This means that the universe is not just copied for each new thread, but also for each point in time of an existing thread. If time travel to the future is to be possible then all future "thread material" must already exists and be in position in order for us to slide to it. This means that all outcomes of all events are already known and already exist. If all the outcomes are already known then the results of die tosses must be known. If each outcome is already known, then why make copies of the universe for the outcomes that did not happen? If the outcome of everything is already known, then there should only ever be one thread. If there can only ever be one thread, then time travel to the past can not be permitted otherwise changing the past would spawn a new thread and the future could not be predetermined. If the future can not be predetermined then time travel to the future is impossible. We therefore conclude that if time travel to the past is possible, then time travel to the future is impossible.

The only way the time travel to the future could be possible is if the future were predetermined. Therefore, time travel to the past can not be permitted.

These two points are restated here:

1) If time travel to the future is possible, then time travel to the past must be impossible.
2) If time travel to the past is possible, then time travel to the future must be impossible.

Since we are passing into the future at every given moment, then we must conclude that time travel to the past is impossible.

2.3.2 Method #2 – A Time Machine

Suppose you were to build a time machine for a single threaded universe, how would you do it? I can only think of one way it could work (assuming enough power could be generated) and this is how the instruction book would look.

To go back in time:
1) Sit in the machine.
2) Select the date in the past.
3) Hit the go button.
4) Please wait: the machine will now emanate an energy field that must propagate to the ends of the universe and cause all physical events to propagate in reverse. Please see note 1 below.
5) Because of the enormous amount of galaxies and stars that need to be thrown in reverse please use alkaline batteries. See note 2.
6) Naturally the material that shields your crew compartment is not made of any material found in this universe and is thus not affected by the energy field. See note 3:

Note1: Because the energy field does not propagate instantaneously to the ends of the universe, some parts of the universe will start backwards before others. We can not guarantee things will be exactly as they were when you arrive.

Note2: Use only under close adult supervision: Forcing the flow of time into reverse will have unpredictable results. Namely the physical forces of nature may reverse causing the instantaneous conversion of matter to energy and energy to matter.

Note3: Because you are shielded from the effects of the energy field, you will not be part of the universe while it is in reverse, the things you have done in your life will not be undone. This is because you will not be there to undo them. You will not be able to go back in time and meet yourself because you are not part of the rearward-moving universe. Because of this, things will not be exactly as they were when you arrive.

To go forward in time:

1) Sit in the machine.
2) Select the date in the future.
3) Hit the go button.
4) The energy field will be directed into the crew compartment causing your physical processes to halt while the rest of the universe continues at its normal pace; see note 4.

Note4: because you are not part of the universe as it travels forward, the future will not contain the things you would have done had you been part of it. You will not be able to meet your future self.

With the time machine method, traveling to the past is prohibitive because of the immense amount of energy required to force the universe into reverse; however, traveling to the future seems realistic because you only have to slow the rate at which things happen in the crew compartment. Therefore, it is the rest of the universe that is traveling through time -- not you.

In either case, because you are "driving" the time machine, you can never run into yourself. You can not go back in time to prevent your own birth anymore than you can go to the future to learn how you die. You will just have to find out the hard way.

2.3.3 Conclusion:

Time is a mechanism of nature that needs to be released from the grasp of Hollywood and science fiction. We should instead speak of "the rate at which things happen." As these papers progress, the concept of time will change into a universal reference that will enable us to measure the rate at which things happen.

2.4 RAWTH: The Rate At Which Things Happen.

The Rate At Which Things Happen (RAWTH) is a term that will be used to replace the concept of time as we know it. The actual term "time" will take on a new meaning.

Consider two atomic clocks, one at the top of a mountain and one at sea level. We know from experience that the clock on the mountain will advance faster than the clock at sea level from the effects of gravity. Does this mean that the clock on top of the mountain is advancing into the future? Will an observer at the sea level station observe the mountain top clock (or for that matter, the mountain) disappear because it is traveling into the future?

The answer is no, both clocks exists at the same time; however, the RAWTH of the mountain clock is higher than the other clock. This only means that the material processes (the rate at which atomic decay occurs) is faster in the mountain top clock.

2.5 The Randomness rule

No event is truly random. So-called random events are caused by a natural mechanism that we just don't understand yet.

Some branches of science use statistical mechanics to model physical events. Such branches include Quantum mechanics, QED and the modeling of radioactive decay.

As radioactive decay is concerned, one only needs to look a radioactive decay series (sometimes called displacement laws) to see that any radioactive isotope is created by the radioactive decay of another heavier isotope. For example Uranium 235 decays to Actinium 227 and then eventually to Lead 207. So for our first causality argument, Uranium 235 decays to cause Actinium 227. Although the decay seems to occur at random intervals, it can not occur without the existence of the proper precursor element. Furthermore, the result of the decay is not random, Uranium 235 decays to Actinium 227, nothing else.

If we cast a block of Uranium 235 out into space at the speed of light we can stop the radioactive decay. Furthermore, if we compress the Uranium 235 we can increase the rate of decay.

Because we can control the rate of decay, then the decay is cause by something that we can manipulate; therefore, radioactive decay is causal and not truly random. We only treat it as a random occurrence because we do not yet know the underlying mechanism and perhaps it is much simpler to model as a random event (See Simplifications 4.2) even if we did know the underlying mechanism.

The modeling of QED is of the same nature as modeling radioactive decay. In QED, all of the possible ways in which the absorption and emission of photons by electrons or other particles are mapped out and the probability of each interaction is assessed and summed by computer to derive the probability of a particular event. Some QED derivations require interactions of future events to completely model some phenomena. Take for example the following passage from the book "QED" written by Richard Feynman;

"Even more strange possibility that the electron emits a photon, then travels back wards in time to absorb a photon, and then proceeds forward in time again. The path of such a backwards-moving electron can be so long as to appear real in an actual physical experiment in the laboratory." -- page 97 to 98.

According to the description in the book, an electron traveling forward in time emits a photon. It then travels back in time to absorb a photon before continuing forward again. This means that there is a period in the time line where the amount of mass in the system triples. You have the original forward moving electron coexisting with the backward moving electron and the final forward moving electron. Not only does this system violate the time travel rule above, it also violates the conservation of mass. The author claims that the backward (in time) moving electron is a positron. This would appease the conservation of mass (and charge) but leads to an interesting paradox. What if the backward moving positron annihilates or alters the path of the forward moving electron thereby changing the future and preventing the positron from being created? Or what if it just alters the path of the forward moving electron such that the emission point is different? The next section will explore this phenomenon in more detail.

God does not play dice with the universe; dice are an invention of man.

2.6 The Causality Rule

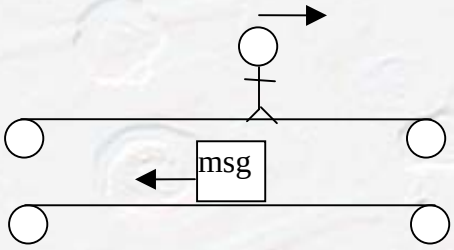
The mechanisms of nature are causal. Since future events can not affect the past, and since there is no true randomness in nature, then all events must be the caused from past or present events and conditions.

We have already discussed the time travel rule; however, here it is again in a slightly different form whose purpose is to support the notion of causality.

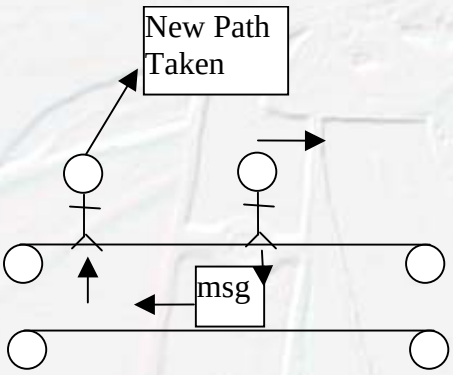
Suppose different regions of space were traveling into the future at different rates, sort of like parallel conveyor belts moving at different rates (perhaps some in reverse). Then is it possible for future events to affect the past?

Let's consider two conveyor belts, one moving to the right which represents a region of space moving forward in time and another moving to the left. The leftward belt represents a region of space moving toward the past.

On the forward moving conveyor belt, a scientist realizes that his experiment is going critical and there is nothing he can do. So he gets the idea to place a message on the backward moving conveyor belt to himself. The problem is that the scientist is moving forward and the message is moving backwards. They are moving in opposite directions such that they will never meet.



The only way that the scientist could receive a message from his future self is if the scientist exists in both the past and the future simultaneously as illustrated by the following diagram.



This requires that all past states of the universe must coexist with all future events on the conveyor belt. This would mean that all future events are already known (or already exists) and all so-called random events have already been predetermined.

If the scientist could send a message back to his earlier self, then this would cause the scientist in the past to take a different course of action. Consequently, this "new path" and all of its future outcomes must already be known such that if the new course of action did not work, the scientist could send back yet another note.

Such a dilemma leaves open the possibility of an infinite loop, requiring the existence of infinite outcomes to be predetermined.

Can infinity be predetermined?

The rules of nature suggest that all the matter/energy in the universe exist at one point in a universal framework that we will call time. The RAWTH may be different for each point in space causing chemical or atomic reactions to happen at different rates, even in reverse (positive mass that enters a negative RAWTH region of space will be converted instantly to energy. This will be discussed in a future paper).

The benefit of this is that the future is not predetermined, it is "now-determined". We can use mathematics and computer simulation to predict the outcome of future events such that we can change our course of action now to avoid calamity (assuming our understanding of nature is correct). This of course requires us to finally fix the remaining deficiencies of mathematics and to one day understand the infinitesimal causes of chaotic phenomenon.

Because the future is determined by interactions that occur now, the universe must be causal. Everything must happen for a reason.

2.7 The Boundary of a Differential

Note: This was originally termed the "Limit of the Differential." The term was changed for clarity.

The boundary of a differential is the smallest non-zero volume that encloses a differential.

Further explanation is given by the following examples:

Example 1: When computing the buoyant force acting on a ship, the integration of the pressure over the entire surface area of the ship is taken. The differential, in this example, is each differential surface area (dS) of the ship. The boundary of the differential is the smallest non-zero volume that contains the differential surface area.

Example2: When computing the emf received in a loop of wire, the integration of the energy received by each differential length of wire is taken. The differential is the differential length of wire. The boundary of the differential is the smallest non-zero volume that contains the differential length.

The following section illustrates the need for the boundary of the differential.

2.8 The Mechanism Rule

The Mechanism Rule: The conveyor of an effect (field, particle, etc.) and the receiver of the effect must exchange the effect within the boundary of the differentials used to compute the total effect. This requires that the conveyor and the receiver must exist within the boundary of the differential at the time when the effect is exchanged.

All natural phenomena have an underlying "mechanism" whereby something is exchanged. This exchange must occur within the boundary of the differential used to compute the total effect. The following examples will highlight this concept by comparing older models that violate the mechanism rule to the newer models that satisfy the mechanism rule.

In the first example, Archimedes' principle (which fails the mechanism rule) is compared to Pascal's work on pressure (which obeys the mechanism rule). Both systems are capable of computing the buoyant force acting upon a ship. Archimedes principle states that the buoyant force acting on a ship is equal the weight of the water displaced. This law gives accurate results but fails the mechanism rule. The mechanism rule states that the conveyor of an effect (in this case water) must exchange the effect (buoyant force) to the receiver (the ship) within the boundary of the differential. For Archimedes principle the force is computed by integrating the volume of the ship that exists below the waterline where: ($V = \int dV$). Because these differential volumes are devoid of water (the conveyor of the effect) then the mechanism rule is violated. Furthermore, these differential volumes, in most cases, are also devoid of the ship (the receiver of the effect); therefore, the mechanism rule is doubly violated. Because Archimedes' Principle fails the mechanism rule, it can not be considered as a model that represents the natural mechanism of buoyancy. This does not mean that Archimedes' is worthless; it only means that we can not assume how the force is conveyed from the water to the ship from this model.

About two thousand years after Archimedes, a scientist by the name of Pascal invented the concept of pressure. This new model allows one to compute the force acting on a ship at any point; including the parts of the ship that are not in the water. The mechanism that conveys the force is the "mechanical" collision of the water (and air) molecules against the ship. Because the force is transferred where the water (or air) contacts the surface of the ship then both the ship and the water (or air) exists within the boundary of the differential. The mechanism rule is satisfied and we have a satisfying mechanism. This model also explains other natural phenomenon that can not be inferred from Archimedes' Principle.

A second example is Faraday's Law, which states that the emf induced in a loop of wire is a constant multiplied by the time derivative of the number of flux lines penetrating the area of space circumscribed by the loop. In this case the conveyor is the magnetic field (or change thereof), the effect is emf and the receiver is the wire loop. By integrating the number of flux lines contained within the area circumscribed by the loop, you end up with many differential areas penetrated by flux lines that do not contain wire. This is in violation of the mechanism rule. How does the behavior of the flux lines at the center of a loop convey an effect to the wire? Is there some other field mechanism that enables this to be true? Why do flux lines outside the loop have no effect?

The new model of induction (see the paper "New Induction"—ni.pdf) states that induction is carried by a disturbance that travels from source to target through space. This means that accelerating charges disturb the medium of space that they pass through. This disturbance then propagates through space (in a manner to be described in a future paper) until it strikes the target wire. Because the disturbance impacts the target, the effect is transferred within the boundary of the differential. This satisfies the mechanism rule. The new law of induction is superior to Faraday's Law and predicts things that Faraday's law can not. In fact the new law of induction is capable of explaining inertia and gravity (see the paper "New Gravity"—ng.pdf).

In New Electromagnetism, all of the laws relate the force on a target charge to the behavior of a source charge. The behavior of the source charge creates a disturbance in the space it contacts. The spatial disturbance then propagates through space until it contacts the target. It is one purpose of this series of papers to publish an improved model for field phenomenon in order to obtain a complete understanding of how these "disturbances" are manifested and propagated.

2.9 The Paradox Rule

The Paradox Rule: A mathematical model that predicts a paradox is a model that does not represent the natural mechanism properly. Nature can not produce paradoxes.

Science employs "models" as a means to understand and predict nature. When modeling nature, one often finds that the models predict paradoxes. This axiom will propose that a paradox is an indictor that a model is incorrect. This does not mean that the model is unusable, only that it is limited in its usefulness and should not be viewed as a correct representation of a natural mechanism.

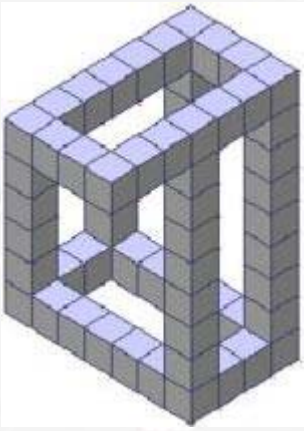


Figure 2-1 By M.C. Escher

The box in Figure 2-1 represents a paradox. It would not be possible to build this box in three dimensions; however, it is easily represented as a two-dimensional line drawing.

In the above drawing we are using a two dimensional model to represent a three dimensional system. If we did not know the limitations of modeling 3-dimensional space with 2-dimensional line drawings, then we would be claiming that it is possible to bend 3-dimensional space (or something of that nature). It may very well be possible to bend space; however, this model should not be used to suggest that this possibility exists.

We must also realize that mathematics has not yet been perfected. One may remember a grade school brain scrambler where the teacher places the following on the board

1) $X=YZ$
2) $Y=X/Z$

Equation 1 is valid for all possible values of Y and Z. Equation 2 is an algebraic rearrangement of 1; yet equation 2 is valid for all values except Z=0. There are many other mathematical shortcomings that are well known. We must not allow these shortcomings to lead to false conclusions as perhaps the line drawing above could.

If a particular model (mathematical or otherwise) yields a paradox then the model suffers from one of the following:

1) We are not representing the model in the correct number of dimensions.
2) We have made a false assumption somewhere along the way.
3) We have a False Positive. A False Positive is a model that gives us correct answers for physical phenomenon but does not reflect a correct natural mechanism. As demonstrated in the first two papers of this series, for any given physical phenomena, there is usually more than one mathematical model that will yield experimentally accurate results. The question is which model is correct.

4) We should find a new model.
5) There is a flaw in the medium we have chosen to model the phenomenon with.
6) Our model is missing important information (no model is a 100% complete; although many model users seem to have forgotten this)

2.10 The Sentiency Rule

The Sentiency Rule: The Mechanisms of Nature must not require objects to be sentient.

There are many antiquated laws of nature that require an object experiencing an effect to be "aware." For example Archimedes principle states that the buoyant force acting on a boat is proportional the amount of water displaced by the boat. How does the boat know how much water it displaces?

For another example, Lenz's Law states that a loop of wire exposed to a changing magnetic field will produce an electric current through itself that will generate a magnetic field to oppose the changing magnetic field. How does the loop know how much flux is passing though the space it circumscribes? How does the loop know where its interior is? How is the loop smart enough to ignore the changing flux lines outside the loop?

I'm not saying that Lenz's law gives the wrong answer, it is certainly practical and useful tool (for limited applications); however, it should not be misinterpreted as a model that describes a true mechanism of nature. This concept is explored in more detail in the paper titled "New Induction" as applied to Faraday's Law (which includes Lenz's Law).

In Einstein's theory of relativity it is said that the objects inside a spaceship traveling at relativistic speeds will experience time dilation. This is fine; however, how do the objects know how fast they are traveling? Does a clock inside the space ship look outside and measure how fast it is going relative to the other objects in the universe? What if the spaceship was standing still and the rest of the universe was in motion, how would the clock know that it is stationary and the rest of the universe was in motion? What if the clock and the spaceship were the only objects in the universe? How would the clock know that it is traveling at relativistic speeds? If time dilation is correct then according to the mechanism rule, the effect of time dilation must be transferred within the boundary of the differential. The motion of the clock relative to the space that it passes through is the only means to model time dilation without violating the mechanism rule. The only other way for time dilation to occur is if the clock were sentient and able to observe and measure its motion relative to some external frame of reference and adjust its material processes accordingly. This can not be so.

In the paper titled "New Gravity", the mechanism of time dilation is derived as an interaction of matter and its velocity relative to space (rather a new abstraction for space), thus satisfying the mechanism rule and the sentiency rule.

The Sentiency Rule does not say that sentient objects do not exist; it says that the laws of nature must not require an object to be sentient/aware in order to work. If you throw a dead person and a live person off a building, they will both accelerate toward the ground below. The law of gravity does not require an object to know which way down is. As a mater of fact, if you place the living person inside a closed box and drop it from a building, the person will experience weightlessness. In this case, neither the living person, nor the dead person is able to tell you which way down is. The knowledge of "down" will not affect the rate at which gravity accelerates them toward the ground; except, that the living person may be able to act in such a way to prevent his own demise.

2.11 Definition: FALSE POSITIVE

Definition: A False Positive is a mathematical model/theory that yields experimentally accurate results and does not represent the true mechanism of the natural event. Some False Positives provide no mechanism.

There are many false positives in science to include Faraday's Law, Archimedes' principle and Kepler's Laws. These laws produce accurate results and are still used; however, not one of the above accurately represents the mechanisms that cause them to be true.

In fact the theory of Relativity falls within the class of False Positive. Relativity gives no explanation of cause for time dilation. In other words, what causes a clock traveling at relativistic speed to experience time dilation? Relativity does not say. The laws of New Electromagnetism, as shown in the paper titled "New Gravity" shows the underlying mechanism that causes time dilation to occur. The new laws of electromagnetism confirm the precepts of relativity by actually providing the underlying mechanisms that cause Relativity to be true.

2.12 The Ambiguity Rule

The Ambiguity Rule: The Mechanisms of Nature are not ambiguous.

It was shown in the paper titled "New Induction" that Faraday's Law is ambiguous. There is an example of a four-sided loop in a changing magnetic field. Each side of the loop experiences the exact same field conditions yet each side experiences charge movement in a different direction. Faraday's Law requires the charges to know where the inside of the loop is (in violation of the Sentiency Rule) in order to know what direction to move in. The Inertial Electric Law, which replaces Faraday's Law, does not require such sentiency on the part of electrons.

2.13 The Reciprocity Rules

The Reciprocal Model Rule: If a natural mechanism is reciprocal, then so should man's model be.

The Reciprocity of Structure Rule: When a model that represents a reciprocal natural mechanism is reduced to its simplest known form, the source (the emitter of the effect) and target (the receiver of the effect) must be of the same structure. If the source and target are not similar in structure, then the model is not the simplest form.

A reciprocal mechanism is a mechanism where the coupling of an effect from source to target is identical to the coupling of an effect from target to source. For example, take an electrical transformer constructed of two mutually inducting loops of wire. It does not matter how the primary or secondary are wound, the mutual inductance from primary to secondary is identical the mutual inductance from secondary to primary. Engineers use a capitol M as the coefficient of mutual induction in the following equation:

$emf_{SECONDARY} = M \frac{di_{PRIMARY}}{dt}$. Since electromagnetic induction is a reciprocal mechanism of nature, then the following is also true: $emf_{PRIMARY} = M \frac{di_{SECONDARY}}{dt}$. The constant M is the same in both cases regardless of how the transformer is constructed.

The first point to highlight is the fact that the natural phenomenon of induction is reciprocal. One will notice the similarity of structure between the source (primary) and target (secondary) of the transformer. Both, the source and target, are loops of wire. Faraday's Law accurately allows one to calculate the effect of the primary on the secondary and visa versa. Thus, Faraday's Law seems to satisfy the reciprocity rules.

The key to the reciprocity rules is "simplest known form." A simpler form of Faraday's Law allows one to calculate the effect of a single primary fragment (very small length) on the secondary (see Figure 2-2). In other words, it is possible to calculate the energy received in a loop of wire, due to the current change through a small length of wire somewhere else. This is considered a simpler form, since we only consider a small fragment of the primary, not the entire primary. To solve this simpler form, one need only perform an area integral over the secondary; whereas, in the previous example, an area integral and path integral are required.

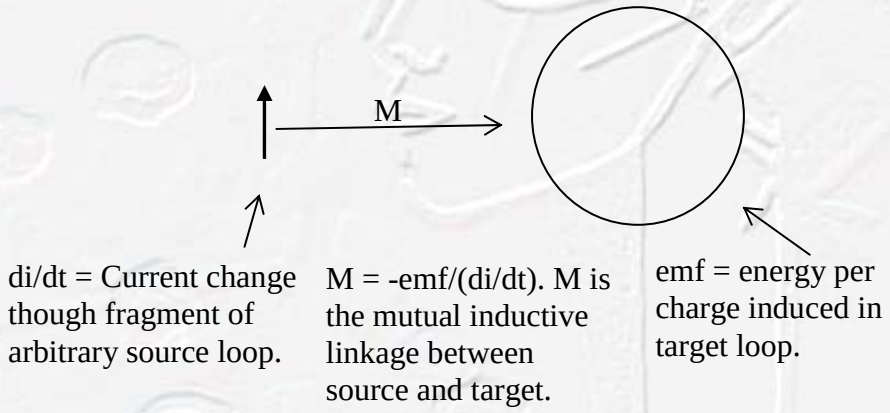


Figure 2-2

The constant M in Figure 2-2 can be calculated easily using Faraday's Law.

Here is where the fun begins: keeping the same elements as in Figure 2-2, switch source and target (see Figure 2-3). If the current change is applied to the loop, then what is the emf induced in the fragment? An experienced electrical engineer will tell you that the M calculated in Figure 2-2, should apply equally to Figure 2-3. This is absolutely correct since electromagnetic induction is a reciprocal mechanism of nature; as demonstrated in the transformer discussion above. Then ask that same experienced engineer to prove it buy calculating M in Figure 2-3 using Faraday's Law. IT CAN NOT BE DONE!!!

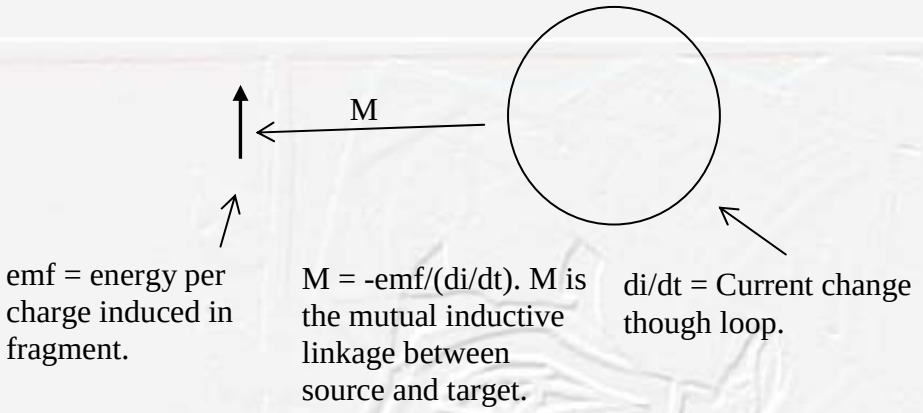


Figure 2-3

We know from experience, that the natural phenomenon of electromagnetic induction is reciprocal; however, Faraday's law fails the reciprocity test in its simplest form.

Notice that it is easy to prove the reciprocity of electromagnetic induction, using Faraday's Law when the problem is from loop to loop as in the transformer example; however, Faraday's Law fails the reciprocity test when the fragment to loop case is considered. This brings us to an important point: reciprocity implies "reciprocity of structure." If a mechanism of nature is reciprocal then any structure that sources energy can also receive energy; therefore, since a loop can source energy, then a loop can receive energy; likewise, since a fragment can source energy (as in Figure 2-2), then a fragment must be able to receive energy. Therefore," reciprocity of structure" compels us to conclude that there exists a model of induction that describes fragment to fragment effects.

An improved model of induction describing fragment to fragment effects (as well as charge to charge effects) is the subject of a paper titled "New Induction". The new model of induction is called the Inertial Electric Law (IEL) for reasons stated in the paper. Applying the new model of induction (IEL) to both Figure 2-2 and Figure 2-3 results in the same value for M. An example of calculating fragment to loop linkage using the IEL (and Faraday's law) can be found in an appendix of the paper titled "New Induction"—ni.pdf.

Comparison of Faraday's Law to the IEL using a "Structural Diagram" shows that Faraday's Law only reveals a subset of the phenomenon of induction. The structural diagram shows source to target linkage between inductive structures. The structures are loops, fragments and point charges. An arrow from the source column to the target column shows that the model allows one to calculate such linkage. Viewing the structural diagram of Faraday's Law (Figure 2-4), one will notice that loop to loop and fragment to loop are the only interactions that Faraday's Law allows one to calculate. If Faraday's Law were truly a reciprocal model, then it should also allow one to calculate loop to fragment linkage as shown by the red arrow in the diagram; however, Faraday's Law does not allow one to calculate the energy transferred in such a configuration.

Note: the light blue arrow in the diagram (marked inferred) shows how Faraday's Law can be extended by substitution of the point-to-fragment conversion identity as described in the paper titled "New Electromagnetism"—ne.pdf. This Identity allows the Biot-Savart Law to be applied to point charges in motion; as well as, current through fragments (differential lengths of conductors).

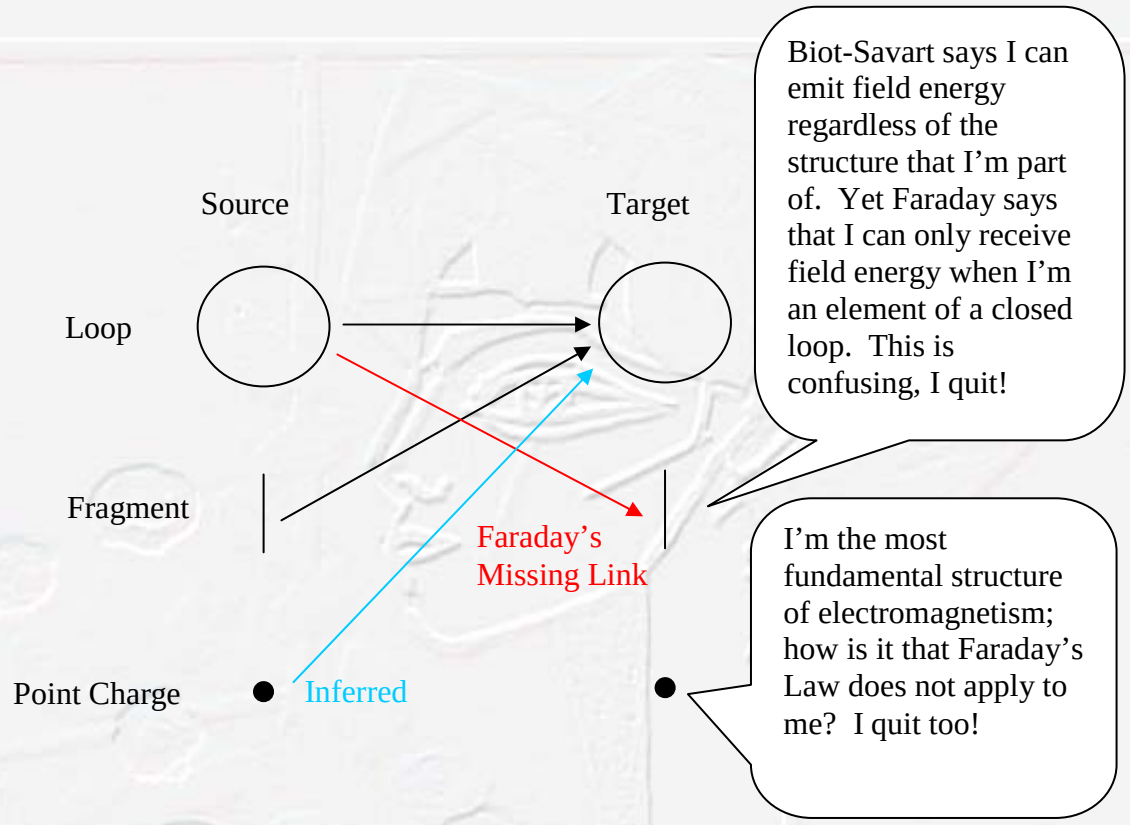


Figure 2-4: Structural Diagram of Faraday's Law

The structural Diagram of the IEL (Figure 2-5) shows no missing links between source and target. The Point form of the IEL is the most basic. By substitution of the "Point to Fragment" conversion identity (see the paper titled "New Electromagnetism"—ne.pdf) any form of linkage shown in the structural diagram can be calculated.

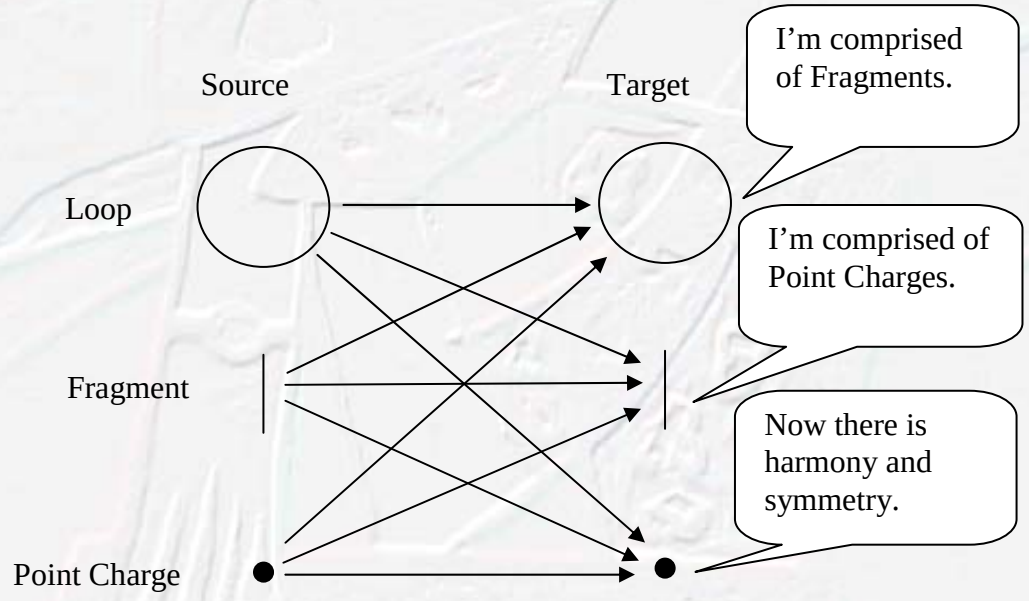


Figure 2-5: Structural Diagram of IEL

By comparison of the structural diagrams, it is evident that Faraday's Law only describes a limited subset of interactions of the natural mechanism of electromagnetic induction.

The most troubling missing link, in Faraday's law, is the link between point charges. If we consider that all fields are generated by forcing charges to behave a certain way, and fields are measured by observing the behavior of charges caught within, then why does Faraday's Law not describe charge to charge interactions?????. The most incredible irony in the history of science is that scientists steadfastly defend a model of electromagnetism (Faraday's Law) that does not apply to the very charges that are the building blocks of electromagnetic phenomena.

All of the models put forth in New Electromagnetism are reciprocal and apply to point charges.

2.14 The Anomaly Rule

The anomaly rule: If nature presents phenomena that a model does not account for (anomalies), the model should be considered suspect. The most insignificant anomalies, when finally understood, may radically change our accepted understanding of nature.

The anomaly rule is described by the following historical example:

Back before Galileo and Copernicus, mainstream science had what they thought was the exact model of the heavens. This model is known as the "Earth Centric" model in which the stars, sun and moon orbit around the Earth. Essentially, the Earth was the center of the universe.

This model gave excellent results for 99.99% (approximate) of the observable objects in the heavens and was therefore deemed the undisputable answer to the workings of the heavens. There were only a handful of objects in the sky that didn't fit into this model. These anomalous objects wandered about the night sky in seemingly random patterns. Scientists called these objects "planets"; which is Latin for wanderers. People mistakenly thought that when planets were finally understood, they would have a logical explanation within the "Earth Centric" framework.

Copernicus suggested a new model in which the Earth is not the center of the universe. Instead, the Earth and other planets orbit the sun. This new model implies that the sun is just one of many stars. It was Galileo who proved and championed this new model.

We know from history the fate that befell Galileo. It was difficult for people to believe that their accepted model, which yields 99.99% correct answers, could be completely wrong. (I'm sure that politics was also a factor). It became easier to persecute a crackpot then for the major institutions to admit that they were not the repositories of correct knowledge.

It was the nearly inconsequential anomalies (the planets) that, when finally understood, resulted in a paradigm shift in our understanding of the heavens.

Distinti's Warning: Be mindful of the seemingly insignificant anomalies, they may be the harbingers of catastrophic change.

2.15 The Correct Answer Rule

The Correct Answer Rule: You can not guarantee that a model is correct even if it gives correct answers. Incorrect models which give accurate results are called False Positives.

Examples of models that predicted accurate results but were later found to be incorrect:

1) The Earth Centric Model (previous chapter)
2) The Flat Earth Model – still used by architects.
3) The theory that dead flesh spontaneously converts to bacteria. This is how the rotting of flesh was explained before Louis Pasture provided a simple experiment that proved the model wrong.
4) The sun god moves the sun around the Earth – it gives the correct answer.
5) Gravity is the bending of space (Relativity) (see New Gravity for a simpler model).
6) Maxwell's Uniform Plane Wave Equation (see our Displacement Experiment or NIA1)

It is a historical fact that new models will arise and obsolete older models. Each step of the way we may not actually have the correct model; however, as more and more anomalies are explained, the confidence increases.

Even if a day comes when all anomalies are explained, it would be foolish of us to assume that we actually have the correct and absolute model. We should never stop testing what we think we know.

This is also true in the game of chess, if your opponent makes the "correct" counter move to your plan of attack then there are only two possibilities:

1) He is less skilled than you in which case he has taken your bait and you will win
2) He is more advanced than you in which case he knows the flaws in the plan that you have presented to him and he will eat your lunch.

For those who don't play chess: your belief of what the "correct" move is depends upon your experience. As your experience increases, moves you would have earlier thought to be crazy, may actual have merit. The same is true in science, as we learn more about nature; the things we once thought to be crazy and outlandish may one day become the correct answer (like the round Earth idea). The key is not to be lulled into the false and arrogant assumption that "we know everything, and we are right" just because we get the right answers.

Mother Nature is an awesome chess player; she has managed to lead us down many false paths in the past. Like a good chess player, we must reexamine every possibility at every move and not fall in love with what we think the true models of nature are. That is the only chance we have for a draw – we should never expect to win. To win means that we think we know what the correct models are; when in fact, it may be another false path (like relativity or classical electromagnetic physics) in which we will stagnate for another century while Mother Nature giggles at our arrogance.

3 Rules of Nature

The Rules of Nature are a set of rules that nature will not violate. As such, these rules can be used as a "litmus tests" to judge whether or not mankind's mathematical models represent a true nature mechanism correctly. As you are probably aware, there is usually more than one mathematical model that yields experimentally accurate results for any given natural system. The question arises, which model more closely represents the way nature does it? Another way to say this is "Which mathematical model truly represents the mechanism of nature?"

In the course of the research of New Electromagnetism, it has been reasoned that nature has certain rules that characterize all of her mechanisms. These Rules of Nature were derived in the Axioms section and are listed here:

The Rules of Nature (RON):
1) The Mechanism Rule.
2) The Paradox Rule.
3) The Sentiency Rule.
4) The Ambiguity Rule.
5) The Time Travel Rule.
6) The Causality Rule.
7) The Randomness Rule.
8) The Reciprocity Rules.
9) The Anomaly Rule.
10) The Correct Answer Rule.

If nature does not violate these rules (assuming that these rules are correct), then it reasons that the mathematical models we use to represent nature must not violate these rules either. This does not mean that a mathematical model is unusable if it violates the Rules of Nature, only that it should not be construed as a true representation of a natural mechanism. For example, Archimedes' principle violates a certain number of the rules above yet we can use it to successfully determine the buoyant force acting on the hull of a ship. Archimedes' principle does not explain how the actual force is transmitted to the ship or where it is applied. For this level of detail one would use models developed by Pascal which do not violate the Rules of Nature.

4 The pitfalls of current modeling schemes

This section highlights other problems with the mathematical models that lead us to false positives or otherwise cause us to diverge from a complete understanding of the universe.

4.1 Displaced Equations

There are many derivations in science where one model/relationship is set equal to another to derive a certain expression. It is essentially two mathematical expressions separated by an equal sign.

Some equations are displaced in time and/or space. This means that although the magnitudes of both sides of the equations are correct, the point in time and/or space that the equivalence occurs may not be same. As an example, consider a rifle shot vertically from the surface of an airless planet of gravity 1 G. The kinetic energy of the bullet at the muzzle of the gun is $E = \frac{1}{2}MV^2$. The potential energy of the bullet is described by the relationship $E = MGH$. These equations are often set equal to each other to derive an expression for determining such values as the height (H) that the bullet will attain. Thus we have $MGH = \frac{1}{2}MV^2$ and $GH = \frac{1}{2}V^2$.

It is understood from the derivation that the potential energy of the system is maximum when the kinetic energy is minimum and the likewise. If one were not aware of how this equation was derived, it could be misinterpreted to say "the higher you go the faster you go." This equation is valid only when H and V are at their maximum values. H and V do not attain their maximum values at the same point in time (or the same point in space for that matter). Therefore this equation is a displaced equation; displaced in time and space.

There is another example of a displaced equation that was unknown to be displaced until described as such in the paper "New Induction." This equation is Maxwell's variation of Faraday's law; better known as

$$\nabla \times \mathbf{E} = -\partial \mathbf{B} / \partial t$$

The above equation is normally understood to mean that a changing magnetic field leads directly to a Coulomb field. It has been shown in section 4.3 of the paper titled "New Induction" that the two field occurrences must be displaced in time. It is shown that a changing magnetic field imparts kinetic energy to charges. These charges then displace; which in turn, causes the measured Coulomb field.

There are certainly other displaced equations in science; an example is Coulomb's law. To show how Coulomb's law is displaced, consider an electron is sitting at the origin of the universe all by itself. Then, all of a sudden, another electron pops into existence a meter away. According to Coulomb's Law, the repulsion felt by the two charges is instantaneous; however, this is not correct. The second charge will feel the force of the first charge immediately since the field of the first charge had time to establish itself. However, it will take time for the first charge to experience an effect since the field of the second charge needs time to propagate from the point where it appeared. Consequently, Coulomb's Law and all of the models of electromagnetism are displaced in space and time.

Deriving the underlying mechanisms of nature from equations that are time displaced may be the reason that sciences such as QED experience missing time that can only be reconciled with time traveling charges.

It is the purpose of the New Electromagnetism series of paper to derive the mechanisms of the fields that carry the forces of nature. This can not be accomplished unless the limitations of the currently accepted models are known; such that, wasting time on such silliness as time travel and paradoxes can be avoided.

4.2 Simplifications

A simplification can best be explained by the "black box" metaphor used when representing ICs in a schematic diagram. In schematic diagrams we do not represent all of the internal components of an IC (e.g. OP-AMP); instead, we treat the IC as an individual component on a schematic diagram. This is done because the simplified mathematical model of the OP-AMP is easier to use than the modeling of thirty or more transistors that comprise the OP-AMP. Through the process of simplification, larger and more complex systems can be developed and modeled. The simplification process has one drawback that must be understood fully if it is to be used effectively for the modeling of nature. This drawback is that certain small details are discarded in exchange for simplicity. For example, engineers use the OP-AMP equation $C = K*(A-B)$ with full knowledge that small details, such as propagation delay (from input to output), are not represented. Simplifications are fine to use as long as their limitations are understood.

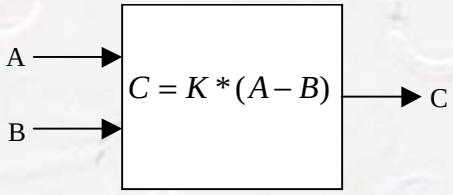


Figure 4-1 Simplified OP-AMP equation

By using multiple levels of simplification, larger more complex system can be represented by fewer, less complicated models. To continue the above example, multiple OP-AMPs are arranged to create a Instrumentation Amplifiers. The simplified model of the instrumentation amplifier omits further details.

The Instrumentation Amplifier itself may be a component of a larger system such as a car stereo system. The final level of simplification might be the users manual for the car stereo which describes the inputs as the control knobs and the output as the sound from the speakers. Because of the loss of detail due to the multiple levels of simplification, there is no way one could derive the operation of a bipolar junction transistor from the owner's manual of a car stereo system. Likewise, there is no way to derive the existence of a transistor directly from the simplified OP-AMP equation.

Although it is impossible to develop the model of a transistor directly from the OP-AMP equation, it is not impossible to derive the model of a transistor from the behavior of an actual OP-AMP as long as all of the characteristics of the OP-AMP are measured. After knowing and measuring all of the "quirks" of the OP-AMP (a "quirk" is a small detail missing from a simplification, such as propagation delay, saturation, input offset, etc.), educated guesses (theories) about the internal workings of the OP-AMP could then be put forward. These theories would then be compared to see how many of the "quirks" are explained. A theory that accounts for the quirks and yields the correct answers in all cases is absolutely possible. However, it is more likely that one will derive a theory that yields the correct relationship, explains all of the "quirks", yet bears no evidence that such a device as a bipolar junction transistor exists. The term for this is a false positive. There are many false positives in science, such as Faraday's Law, Archimedes principle and Kepler's law, that yield experimentally accurate results and yet bear no indication of the underlying mechanism that cause them to be true.

A way to increase the odds that a lower level mechanism can be properly identified from a higher level mechanism is to increase the number of higher level mechanisms that must be explained by the theory that is under examination. For example, if the theory of the lower level mechanisms needs to explain the

behavior of the above OP-AMP as well the behavior of other devices known to contain the same mechanisms, then the permutations of false positives can be reduced.

Another way to reduce the number of false positives is to decide on a set of rules that we are sure can't happen within the realm of the lower level mechanisms. A set of rules for the above example might read:

1) All underlying mechanisms must be causal.
2) No paradoxes allowed
3) No time traveling.
4) …

For that matter, the RON are obeyed in the underlying mechanisms that describe the innards of the OP-AMP.

Just think of how many different ways one could devise a false positive theory for the OP-AMP if say time traveling currents or sentience were allowed. Considering that the power supply connections are not represented in the simplified model; how would one explain the over-unity power gain?

Let's reexamine the laws of electromagnetism (OLD or NEW) in light of this concept of simplification to see how much information we are missing:

1) Charges are described in electromagnetism are point charges. What happens if two like charges actually come into contact with each other when matter collapses at the speed of light? We can't know because electromagnetism is the science of "action at a distance" and the models do not describe the physical aspects of real charges other than their effects of each other at distances. When I say real charges I do not mean electrons. An electron is a system of real charges. According to Coulomb's law, if the distance between two charges approaches zero, the energy of the electrostatic field approaches infinity; can this be true? What is the lower limit where Electromagnetism is still valid? This information is contained in the follow-on series to New Electromagnetism called Ethereal Mechanics.
2) Field velocity is not contained in the equations. Like in the earlier example, if a charge instantaneously "pops" into existence at a point in space, how long would it take before another charge somewhere else feels the effect? In the case of waves on a string, the velocity that tension travels down the string is much faster than the velocity that a transverse wave travels down the string. Since Coulomb forces are to space what tension is to string (Actually the tension in string has been shown to be Coulomb forces), then it would be logical that the Coulomb forces travel faster through space than transverse electromagnetic phenomenon (light).
3) How do charges affect space?
4) What is space?
5) How do the disturbances travel through space?
6) How do the disturbances couple with another charge?
7) What is a charge?

The above questions can not be answered with present electromagnetic theory since it only a suite of simplified equations that relate "action at a distance" between charges.

It is important that we understand the limitations of our tools and the propensity for false positives they can produce. It is one of the intents of this paper to aid in reducing the probability of a false positive.

4.3 ABSTRACTIONS

Another problem with modeling techniques is abstractions. Mankind employs abstractions in order to simplify the visualization of and/or the teaching of difficult subjects. Abstractions, such as field lines, often take on a life of their own becoming, in the mind of scientists, an actual manifestation of nature. This

provides a barrier to new ideas such as New Electromagnetism, which does not require the knowledge of fields in order to calculate cause and effect. This does not mean that fields do not exist; it means that field lines are only abstractions just like the longitude and latitude lines on a globe. They are useful; however, they do not exist.

In fact we really can not say that flux lines do in fact exist. Forcing charges to behave a certain way generates an electromagnetic "field." An Electromagnetic "field" is measured by observing the behavior of a test charge at a given point within a known field. All that can be said is that a field is an area of space which affects charges in a known way. As the paper titled "New Electromagnetism" has shown, all electromagnetic "field" phenomena can be reduced to the effect on a target charge due to the behavior of a source charge at a given distance. The exact mechanism that couples energy from a source charge to space, the mechanism that allows the energy to travel through space and the mechanism whereby energy in space is coupled to a target charge can not be derived from the laws of electromagnetism. This is because the laws of electromagnetism are simplifications.

4.4 Misunderstood

Some mathematical equations are not understood completely.

One equation that falls into this category is Gauss's Law. This law states that the amount of charge contained in a given region of space can be determined by performing a surface integral over the region and counting the electric flux lines that pass through the surface. What if the region contains a block of lead? According to Gauss's law the integral of the flux lines exiting the space will equal zero. This can not be correct because we know that the lead contains equal and opposite amounts of charge. Therefore, Gauss's Law must be rewritten to say that the result of performing the integration is the NET charge contained in the region. It is not correct to assume there is no charge in a region of space where Gauss's law yields a zero result. A zero result of Gauss's laws means only that the NET charge is zero.

Another equation that has long been misunderstood is Faraday's Law. Faraday's Law only yields the NET emf received by a loop of wire contained in a changing magnetic field. This is effectively explored in the paper titled "New Induction."

4.5 Conservation of Energy: Panacea or Pitfall?

It is a common practice to use Conservation of Energy techniques as a means to simplify the analysis of what would otherwise be a very complex force equation. For example, Ohm's Law reduces circuit analysis from complex vector equations to scalar quantities of Volts, current and Resistance.

Modeling natural phenomenon in terms of energy (such as voltage in a circuit) enables us to work with simple algebraic expressions instead of vector equations; however, like all tools at our disposal, there are pitfalls associated with conservation of energy techniques that seem to have been forgotten over the years.

There are many natural phenomena that have no valid force equations to explain them (we will show some examples in a moment). Without valid force equations, researchers commonly resort to conservation of energy techniques to develop some kind of useful model for exploitation of the given phenomenon. This by itself may lead to problems; however, the real problem arises when researchers claim that from conservation of energy techniques that they "figured out the true mechanism of the phenomenon."

Since energy is a scalar quantity, it is missing the vector quantity associated with a force; as such it is only a simplification (see chapter 4.2). Trying to infer unknown vector equations from scalar models is problematic at best. The next sections show the problems and difficulties encountered when attempting to deduce answers from conservation of energy techniques.

4.5.1 Intrinsic Inductance:

For a complete definition of intrinsic inductance (some call it internal inductance) see our free paper New Induction (ni.pdf) found in our Publication Index.

Since Faraday's law fails to explain this phenomenon, classical researchers made an attempt to "reverse engineering" an expression for intrinsic inductance from the amount of field energy contained in the wire. They deduced a relationship for intrinsic induction which is $\frac{\mu}{8\pi}$ Henries per meter. This relationship does not accurately reflect measured values for intrinsic inductance. (see ni.pdf for measurements). The above expression shows only a relationship with length and no relationship to wire cross section. Most experienced engineers will confirm that intrinsic inductance is indeed dependant on wire cross section (thickness). Thicker wire has less intrinsic inductance than thin wire.

4.5.2 Homopolar generator problem 1

In the Homopolar generator paradox (see homopolar.pdf) where the magnet and disk rotate together, classical theorists claim that the emf is generated in the closing path (since that is the only element that cuts flux). New Electromagnetism (specifically New Magnetism) teaches us that the emf is developed in the disk (always). Both models give the same result for open loop emf. Remember that emf is energy per charge; also remember that open loop emf is by definition voltage. And voltage is the same between any two points regardless of which path you take (conservation of energy). So whether you integrate the path through the disk (the New Electromagnetism method) or the path through the closing loop (claimed by classical theorist) you should get the same voltage. Therefore, it is impossible for ANYONE to claim that they know (just from a simple open loop emf measurement) where the power is such a device is generated. Fortunately, there is a relatively simple method to determine where the power in such a Homopolar generator is developed. This method is the topic of a soon to be released paper (**hpg_closing.pdf**) that defines an experiment that we are preparing for the Yankee Invention Expo (18 Oct 2003). **--- Note: the paper mentioned previously is superceded by Paradox 2 Experiment (note added 10 Feb 2004).**

4.5.3 Homopolar generator problem 2:

"Customary physics don't prescribe how the forces produced by the closing wire on the magnet are distributed on its bulk, which make impossible the direct calculation of the relevant torque"

-- Jorge Guala-Valverde

See **jgv_bf.pdf** in our Homopolar Technology Section for the complete text of Jorge's paper. It is our opinion that Jorge's work is of the best application of classical electromagnetic physics to explaining the seemingly paradoxical behavior of Homopolar Devices.

The above paper uses conservation of energy techniques (coupled with classical electromagnetic theory) to explain the back torque in all modes of operation of a Homopolar Generator (HPG). Though the above sentence is from the case where the magnet and wire move together, the explanations of back torque in the other cases are still assumed from conservation of energy techniques.

From conservation of energy techniques the only thing we can say for sure is that a back torque must exist; however, we can not be sure from these techniques how, when and where the forces manifest themselves

(as Jorge has confirmed). Conservation of energy techniques are like saying "what goes up, must come down"; this being true, we can not deduce how, when or where unless we have the force equations.

Classical theorists seem to be hung up on the notion that the back torque must be a reaction between the rotating system and a stationary element (again, they point their finger to the stationary closing path as the ONLY possible explanation when the magnet and disk rotate together). However there is another possibility, consider the following thought experiment:

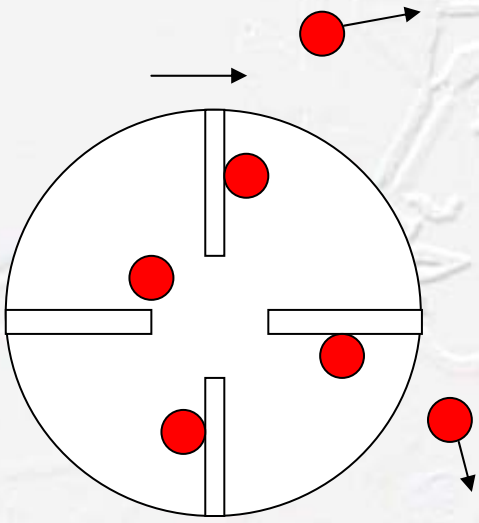


Figure 4-2: Coriolis wheel

In the above experiment, red balls are poured into the center of a spinning wheel. The back torque of this system comes from the fact that as the balls move outward they are accelerated tangentially and radially.

If we were to place a ring around this system to prevent balls from exiting, the wheel will fill with balls. Once the wheel is full and no more balls can be introduced, there are no more accelerations occurring and the back torque is at minimum. This is equivalent to a No-Load condition.

If the ring is removed and we are able to introduce balls as fast as they exit the center, the driving motor will be accelerating an incredible volume of balls and the back torque is at maximum. This is equivalent to a short circuit (or maximum load) condition.

In the above thought experiment, we show a rotating system in which back torque is developed completely within the rotating element has nothing to do with a stationary element. Are there other such explanations, absolutely!

The Coriolis acceleration of charge moving through a Homopolar wheel is a factor (not the only) in Homopolar back torque. Those who have purchased the book New Magnetism have what they need to figure it all out. We are releasing supplements and software which will enable full analysis of Homopolar generators regardless of mode of operation. We presently have a software package out for proper magnet specification and another that enables open loop emf calculation for HPGs. These software and supplements are only available to those who have purchased the book New Magnetism.

There may be many other ways to explain the back torque in the system; however, without the proper and correct force equations we will never know. Conservation of energy techniques have unfortunately become a crutch for those who are too afraid to ask the hard questions.

4.6 Nature vs Mathematics

A few hundred years ago (exact details escape me), it was important to determine if nature could be described mathematically. Somebody proved that this was indeed the case. This was a wonderful realization, since mathematics is the most robust modeling tool currently available to mankind.

As stated in a previous section, no model is 100 This has unfortunately caused many researchers to assume that what is algebraically possible must be physically possible spend fruitless years toying around with pure mathematics looking for some kind of answer to the universe (such as string theory).

4.6.1 Mathematics is a Superset of Nature

Although it is possible for mathematics to model nature, it is also possible for mathematics to describe a hypothetical universe with any number of dimensions; even fractional dimensions (see the science of fractals). Some of the most touted models for the "Theory of everything" place the number of dimensions of the universe somewhere under 12. This alone shows that there may be infinite mathematical models which could describe a physical system.

To use an analogy, suppose there were a physical system such that some function of 2 and 2 equals 4 (f(2,2)=4). How many different functions could we find that would relate 2 and 2 to 4? The following are some suggestions:

1) 2+2=4
2) 2*2=4
3) 2^2=4
4) …..

For a real life example, the search for New Induction used a computer to search through over 45,000 unique geometric relationships (we use the term geometries for simplicity) to find one suitable to describe New Induction. The search resulted in 58 geometries that predict the experiment within the range of experimental error. Since there are an infinite number of possible geometries (and dimensions) that we could have searched, then there are theoretically an infinite number of mathematical models to describe the Rhombus experiment. If the logic follows, then there should be an infinite number of mathematical models to describe any natural phenomenon. It is logical that nature only has one mechanism for any given force phenomenon; as such, there is only one mathematical model that correctly describes the underlying mechanisms we seek to understand. The remaining models are false positives. These Rules of Nature were developed to help reduce the number of false positives.

Note: We should not preclude the use of false positive just because they do not describe the proper mechanism. It is possible the some false positives may be simpler to use in certain circumstances.

4.6.2 Mathematical rules are not necessarily Physical rules

Simply put, mathematics enables you to do things that make no sense in reality. Here is a course example:

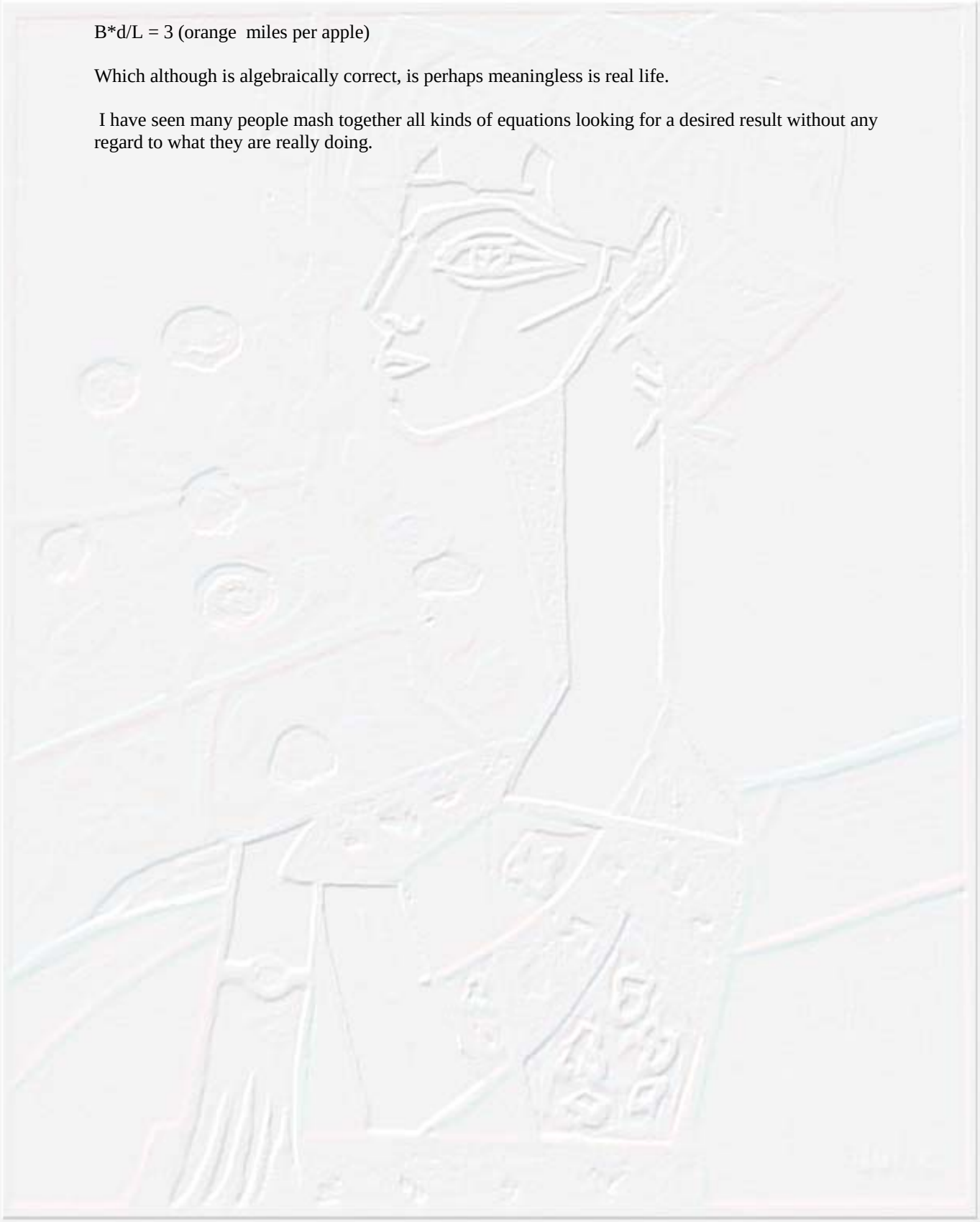
Marry has 3 apples in her left hand, 6 oranges in a bag and has to walk 1.5 miles to get home such that
1) L=3
2) B=6
3) d=1.5

Algebraically we can do the following

B*d/L = 3 (orange miles per apple)

Which although is algebraically correct, is perhaps meaningless is real life.

I have seen many people mash together all kinds of equations looking for a desired result without any regard to what they are really doing.



5 Conclusion

It is the purpose of the future papers of the New Electromagnetism series to divulge the underlying mechanisms of electromagnetism (which now includes gravity, see “New Gravity”) to include the actual field mechanisms and field material.

The above can only be accomplished effectively if it is understood where we stand with respect to that goal.

We must first understand that all present laws of electromagnetism are higher level simplifications that are displaced in time and space. As long as these pitfalls are understood, as we venture forward, we are less likely to be trapped.

Secondly, all derived mechanisms will obey the rules of nature as put forth in this paper. This paper is to be considered a living document, as new rules are discovered or current rules determined to be incorrect, this paper will be updated accordingly.

According to section 4.2, it is possible to derive the underlying mechanisms from these simplifications; however, it behooves us to have to most complete understanding possible before venturing onward. For this reason the paper titled “New Magnetism” will be released to divulge a wrinkle in magnetic field theory that must be addressed before the first paper of Ethereal Mechanics is released.