PART 3
BASES & ANALYSES
OF MEASUREMENT UNIT SYSTEMS

Scope

These chapters of Part 3 lay the measurement unit groundwork which goes hand-in-hand with the numerical work that was done in Part 1. Here analyses, both conceptual and specific, are given for the underlying basis for the system of units that were used with the mathematical-geometric values developed in Part 1.

An important note is in order here. The author apologizes in advance for the length and density of the chapters / reports in this Part 3 of the overall book. This material, the detailed blow-by-blow investigation and analysis of measurement systems was forced upon the author by certain very vicious and nasty physicists. In numerous communication encounters the author was beaten about the head and shoulders with the constant harangue, "What if the length of the meter was different"? The probability that the correlations / equations discovered for the 5 elementary physical properties of the leptons and photons, discussed in Part 1, of being 5 chances in 10^{13720} of being accidental and meaningless was not good enough for them.

So the author took up the challenge to prove that the results of the mathematical-geometric calculus and differential geometries used there were indeed measurement system independent. These next six reports are a defense of his work. They cost 4 1/2 years of the author's life. As can be imagined, author isn't too happy either about the knit pick-i-ness which was unfortunately necessary to keep angry particle and hypothetical physicists at bay.

Likewise the author got tired of kindly and friendly physicists, who were just trying to be helpful, always making the same suggestions and recommendations that the measured masses of the leptons should be ratioed together. Or equally that the equations for the individual electron, muon, and tau which took 12 1/2 years to discover should be ratioed together as a means to throw away with their measurement units and make them into little sterile unitless blobs. Why would the author destroy 12 1/2 of work just to satisfy some paranoiac fear of measurement units? One of the major objectives of Chapter 3.1, the entire Section 3, became to again defend this work from such fear based ideas of how to proceed.

General Notes - Definitions

There are some general notes which apply to all the chapters / reports in this Part of the book. Further, these notes apply to and should be remembered for all Parts of this book. In this work the following definitions or meanings are used:

1 Lepton(s) -- Means the the electron family; the electron, the muon, and the tau, or their charge reversed counterparts of the positron family.

It does NOT mean the electron family plus the neutrinos in this work.

2 Unit(s) -- Means measurements units, either; the relative SI units, the absolute Squigs units, or generic, meta, place-holder, universal, or as yet unspecified parametric units. These are always static quantities, "blobs" of something, and not quantities plus motion to make dynamics.

It does NOT mean the number of decimal places in a number. The author gets tired of having to repeat the word measurement before the word units.

3 Dimension(s) -- Means spatial and temporal dimensions.

It does NOT mean variables, parameters, measurement units, or the number of arguments for a mathematical function or expression. It does not mean the parameters which are often grouped together in engineering, scientific, and technical work under the heading of "Dimensional Analysis" or to make "Dimensionless Numbers". The author gets tired of having to repeat the word spatial before the word dimensions.

A general reminder is needed that the world size realm of George Johnstone Stoney and the particles, the electron family, is at a scale 36 orders of magnitude smaller in distance than humans and

44 orders of magnitude smaller than the human invented second. The electron is 33 orders of magnitude smaller in mass than a human and the quarks appear to inhabit a world of 4 spatial dimensions. Futher the little critters of investigation are really only just wave forms or energy bodies and do not really have any "solid" form. Assuming or trying to impose laws and physical property inter-relations upon them based upon the human world experience and mechanics is a seriously dubious proposition.

There are several basic physical constants that are used in this work, specifically throughout PART 3 in some of its chapters. These are repeated from Table 1 of the introduction to Part 1.

Table 1 Basic Physical Constants Used In This Work [1]

FUNDAMENTALS, a-priori	UNITS	NUMERICAL	ERROR
G, gravitational constant	$(m/kg) \times (m/s)^2$	$6.672,59 \times 10^{-11}$	8.5×10^{-15}
ε_o, electrical constant	$C^2/(kg\ m) \times (s/m)^2$	$8.854,187,817 \times 10^{-12}$	0
μ_o, magnetic constant	$(kg\ m)/C^2$	$1.256, 637,061 \times 10^{-6}$	0
DERIVABLE, but used as a-priori			
e, electron charge	C	$1.602,177,33 \times 10^{-19}$	4.9×10^{-26}
α, fine structure scaling constant	$((ML)(L/T))^{-1}$	$7.297,353,08 \times 10^{-3}$	3.3×10^{-10}
DERIVATION OBJECTIVES			
electron mass	kg	$9.109,389,7 \times 10^{-31}$	5.4×10^{-37}
	MeV/c^2	0.510,999,06	1.1×10^{-7}
muon mass	kg	$1.883,532,7 \times 10^{-28}$	1.1×10^{-34}
	MeV/c^2	105.658,389	3.4×10^{-3}
tau mass	kg	$3.167,88 \times 10^{-27}$	5.2×10^{-31}
	MeV/c^2	1,777.05	+0.29, -0.26
DERIVABLES			
c, speed of light	m / s	$2.997,924,58 \times 10^{8}$	0
h, Planck constant	(kg m) (m/s)	$6.626,075,5 \times 10^{-34}$	4.0×10^{-40}
CALCULATED, for scaling	FORMULAS	NUMERICAL	
G, see Lepton Report, Sec 4.1	G_improved	$6.672, 590, 32 \times 10^{-11}$	
L_absolute / Q_relative	$\mu_o (G\ \varepsilon_o)^{1/2}$	$3.054,438,950 \times 10^{-17}$	
meter per L absolute, (m / l_{Sgs})	$e\mu_o(G\ \varepsilon_o)^{1/2}$	$4.893,752,96 \times 10^{-36}$	
Conversion, (ML^2/T) rel / abs $[kgm\ (m/s)] / [m_{Sgs}\ l_{Sgs}\ (l_{Sgs}/t_{Sgs})]$	$e(\mu_o / \varepsilon_o)^{1/2}$	$9.670,562,404 \times 10^{-36}$	
MeV per kg	$1/ (10^6\mu_o\varepsilon_o e)$	$5.609,586,16 \times 10^{29}$	
$l_{Sgs} \times MeV/C^2$	$(G/\varepsilon_o)^{1/2} / 10^6$	$2.745,192,89 \times 10^{-06}$	
1 / (2α)	(ML)(L/T) abs	$6.851,799,475 \times 10^{1}$	

[1] E.R. Cohen, The Physics Quick Reference Guide, AIP Press, 1996, p.54-56

There are several items to be noted in this table.

1 In these chapters and in the other parts of this work, the units listed with numerical quantities intentionally have the grouping for velocity $(L/T)^{\pm n}$ or specifically $(m/s)^{\pm n}$ isolated from the other units where possible for conceptual reasons.

2 The listing of units with α are intentional. These units have been rigorously derived (proven) in Part 3, Chapter 3.4 Systems Analysis I, Section 5. As clearly demonstrated this constant is actually the result of the value of *h* with relative units of (kgm^2/s) which has been imported into the system of

absolute physics Squigs scales. This constant α can be rigorously shown to have the absolute units of (ML^2/T) or specifically $(m_{Sgs} l_{Sgs}{}^2/t_{Sgs})$ for SI based humans. This is with the quantity $e^2(\mu_o/\varepsilon_o)^{1/2}$, in this specific case, being a conversion constant from the relative to the absolute with units of [kgm (m/s)] / [m_{Sgs} l_{Sgs} (l_{Sgs}/t_{Sgs})]. Generalizations from this specific case should not be made to other usages of the quantities e, μ_o, and ε_o.

3 As is obvious the relative SI unit of kg comes with the listed masses of the electron, muon, and tau. These units cannot be thrown away, no more so than the measurement units of any other data can be thrown away. They are part of the data.

The following unit designations are used in this and the other parts of this work.
Relative units are from the SI set of common measurement scales.

distance-length	meters (m)
duration-time	seconds (s)
mass	kilograms (kg)
charge	coulombs (C)

There are, absolute or "natural" physics scales appropriate to this sub-sub-atomic scale of distance and time. These are the Squigs scales based upon the measurement units put forth by George Johnstone Stoney in 1874. Except the Squigs scales have had his assumed 2 or 3 dimensional π constants removed.

Absolute units are from the Squigs set of "natural" scales. These scales are defined as follows.

Table 2 Definition Of Absolute Physics Measurement Units

Quantity	Symbol	Input -- Exponents of Unit Combinations				Derived -- Exponents of Force Constants				1 Squigs or Absolute Unit = n Common or Relative Units	
		L	T	M	Q	G	ε_o	μ_o	e	n	reciprocal
Length	l_{Sgs}	**1**				**0.5**	**0.5**	**1**	**1**	4.893753×10^{-36}	$2.043422 \times 10^{+35}$
Time	t_{Sgs}		**1**			**0.5**	**1**	**1.5**	**1**	1.632380×10^{-44}	$6.126024 \times 10^{+43}$
Mass	m_{Sgs}			**1**		**-0.5**	**-0.5**		**1**	6.591572×10^{-09}	$1.517089 \times 10^{+08}$
Charge	q_{Sgs}				**1**				**1**	1.602177×10^{-19}	$6.241506 \times 10^{+18}$

Absolute units are from the Squigs set of "natural" scales. These are defined as follows.

Absolute distance = Squigs distance, $l_{Sgs} = G^{0.5}\ \varepsilon_o{}^{0.5}\ \mu_o{}^1\ e^1$ = 4.893,753 x 10^{-36} relative meters
Absolute time = Squigs time, $t_{Sgs} = G^{0.5}\ \varepsilon_o{}^1\ \mu_o{}^{1.5}\ e^1$ = 1.632,380 x 10^{-44} relative seconds
Absolute mass = Squigs mass, $m_{Sgs} = G^{-0.5}\ \varepsilon_o{}^{-0.5}\ \mu_o{}^0\ e^1$ = 6.591,572 x 10^{-09} relative kilograms
Absolute charge = Squigs charge, $c_{Sgs} = G^0\ \varepsilon_o{}^0\ \mu_o{}^0\ e^1$ = 1.602,177 x 10^{-19} relative Coulombs

Finally generic, universal, meta, place-holder, or as yet unspecified parametric units, either relative or absolute, are designated as follows.

distance-length	L
duration-time	T
mass	M
charge	Q

These Reports Cover Material as Follows:

Chapter 3.1 Measurement Units & Scales General Introduction
This report introduces the concept of the absolute necessity of using measurement units with all numerical values. Among several other topics, this report discusses the conceptual or definitional differences between relative, absolute, and universal measurement units. Admittedly this chapter is long. This is because of the almost complete lack of teaching and discussion of measurement units in grade schools, high schools, and even at college levels in the United States. Much information needs to be filled in on this subject.

Chapter 3.2 Absolute Measurement Systems - Example Of Usage
This report gives a short demonstration using the gas laws of the use of absolute scaled values. Some of the final results of this demonstration carry implications for the measurement unit system work done in the later chapters of this Part 3.

Chapter 3.3 Measurement Systems Bases
This report introduces the measurement unit system basis that is used in this work. Thorough analyses are made of the conceptual definitional and mathematical bases of the human scientific metric system of scales. Implications are explored of the flaws or limitations built into these relative measurement units because absolute physics scales are based or build upon them. Admittedly this chapter is long. This is because of the incredibly tangled web that science and in particular physics has made of the mathematical and conceptual bases underlying the SI set of relative scales. Picking thru this maze requires much thought and explanations.

Chapter 3.4 Analyses Of Measurement Systems I
This report begins an analysis of absolute physics scale grids. The human absolute physics Squigs scales used in this work along with their underlying relative metric scales are compared in a side-by-side fashion with a completely fictitious set of parallel relative Samanthan Feline scales and absolute Samanthan Purrfect scales. Admittedly this chapter is long. This is because the construction, proper use, and detailed analyses of absolute physics scales appear to not be taught at all to university level engineering and science students in the United States. So much needs to be presented and learned on this topic.

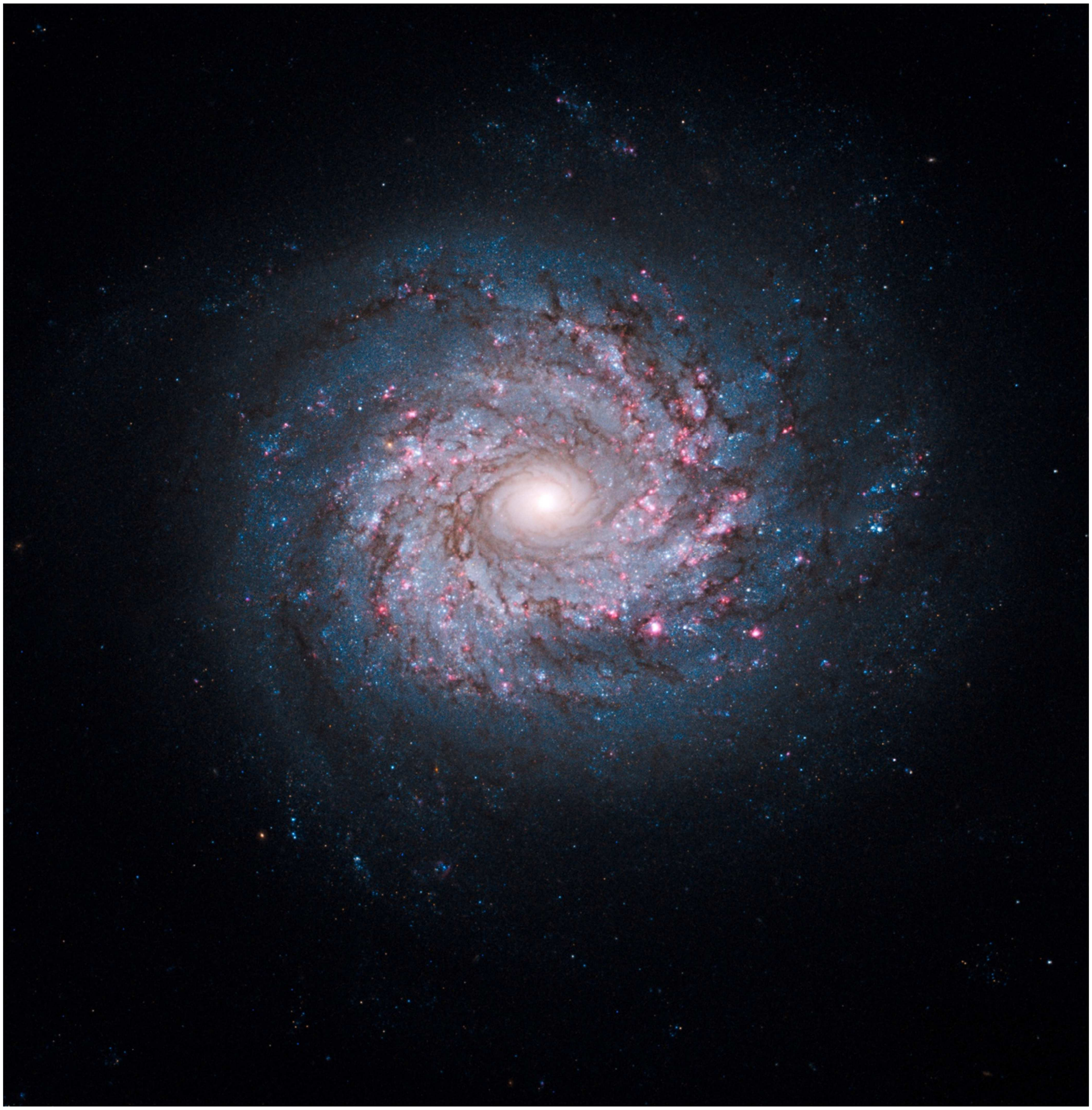
Chapter 3.5 Analyses Of Measurement Systems II
This report continues the analysis of absolute scales and grids. In this chapter repeated difficulty is run into as several attempts are made to prove the universality, measurement unit system independence, of two of the key scaling constants used in this work in Part 1. Ultimately a conclusion is reached that there is something incompatible between the human unit systems and the Samanthan unit systems as they are defined in Chapter 3.4.

Chapter 3.6 Analyses Of Measurement Systems III
This report completes the systems analysis to show the universality of the numerical constants used in Part 2. This is done in a very rapid manner, once the issue is exposed of the compatibility or lack thereof between different measurement scale systems.

PART 3 List Of Contents Page

PART 3 List Of Tables

PART 3 List Of Figures



CHAPTER 3.1 MEASUREMENT UNITS & SCALES

GENERAL INTRODUCTION

1 Overview & Scope

This report begins at the very beginning of mathematics, science, and engineering. The use of numbers is taught in elementary school. The concept and use of measurement units which rightfully go with numbers appears to be sadly lacking, neglected, misunderstood, or even treated with distain by some technical persons. There are several facets related to units of measure which need to be clarified and even emphasized before further discussions of analyses of measurement systems are reached later in this Part of these collected reports.

First the utter necessity of having measurement units associated with numbers cannot be denied. There cannot be a meaningful discussion involving any enumeration, quantity, or quality without measurement units. Specifically in this report ratios are thoroughly discussed, since the making of a ratio is the means by which many persons attempt to "do away with" units. The concept of the applicability and scope of all units of measure are examined. Definitions can be made of whether a unit is of a relative nature, is absolute, or universal in scope. The zeroing of the lower reference of a scale for a unit of measurement is emphasized as not being that which makes the unit absolute. Rather whether the scale reveals something about the inherent structure of the topic of discussion is what makes of a scale absolute or not. The construction of scales is discussed and how to rigorously map a value, a position on one scale, to another scale for linear scales. What is left out of and forgotten by all the shortcut unit conversion formulas and tables is again brought to light. Finally the topic of dimensions is touched upon and what various groups of technical persons mean by this word.

2 Preliminaries

2.1 Numbers Must Have Measurement Units Or References

The following broad sweeping assertion is proposed as the means of starting the discussions in this report. Except for simple numerics, such as 2 + 2 learned in grade school, and the constants found embedded in upper level mathematical equations there are no unitless numbers which are meaningful or useful for anything.

The reasons for this are simple. Any physical system under discussion has a content. This content must be described somehow. This description of a physical phenomena must include some measure of sizing, quantity, or quality. Otherwise the person describing a system has no way of knowing whether their audience is correctly understanding the information being transmitted. Numbers are used to transmit this sense of scaling. All numbers are the symbolical representations for the human concepts involved in the counting of objects or populations, describing physical properties, measuring the size or strength of some physical phenomena, describing social phenomena, economic values, or other such activities. As such numbers must refer to something, a quantity or a quality. Without these references, the numbers are meaningless and useless. Without references or measurement units, the numbers are not useful in any communication, analytical or intellectual endeavor.

In politics the content of discussion often represents members of a population and is discrete. But which population or sub-sector of the general public? A reference or specification is needed. In economics the arena of discussion concerns amounts of money. These amounts can be simply enumerated. Even here, though, specification is needed such as; Canadian dollars, constant 1950 German marks, etc.

In science often the content of discussion is continuous and must be sized, measured, or specified in some manner. Currently there are two primary independent scales of measurement used by science. These are the two basic human measuring sticks of distance and time. In the SI scales the measurement units are meters (m) and seconds (s). Next there is the third descriptor for a static quantity of mass, kilograms (kg). This was and still is linked to the unit of length thru the original definition; 1 gram = 1 $cm^3 = (10^{-2}\ m)^3$ or equally 1 kg = $10^{-3}\ m^3$. A fourth scale is defined in terms of these three; that for a measure of electromagnetic content. This linkage is thoroughly discussed in Measurement Systems Bases, Section 5.2. Although early scientists gave the electrical charge definition as a flowrate, amperes (A), the item of interest in this overall work is the static quantity, coulombs (C). In this work static amounts are used, blobs, quantities; a quantity of distance-length, duration-time, mass, or charge (L, T, M, Q). For this work the focused is on beginner level statics and does not get into the tangled web of dynamics, or with its high level embedded topic of relativity. For these reasons flowrates, fluxes, circulations, et cetera are avoided.

There are also several other primary scales for various scientific quantities such as; temperature, amount of chemical substance, and luminosity. Additionally there are many other derived, secondary, or associated scales. These are used to describe or give a sense of scale to most of the remaining common quantities found within the various arenas of engineering and science. There are named references for pressure, contained energy-heat-work in its many forms, radiation, etc. There are several dozen specialized scales used in electrical engineering referring not only to quantities, but also to dynamic concepts such as flowrates (fluxes), flux densities, resistances to flow, etc.

Only the first four measurement scales are of interest in this work which discusses elementary physics constants. The two human concepts of distance in space and duration in time have existed for as long as there has been a conceptualizing species on the planet. Arbitrary systems for sizing, scaling, or measuring these parameters have been built into every culture and language. Likewise the intermingled concepts of mass, weight, amount of substance, and density have existed for probably tens of thousands of years, ever since humans started throwing stones at prey. They needed to know could they throw a particular sized stone the required distance, and would the stone do any damage when it got there. With the working of metals, inevitably human technology discovered the electromagnetic forces and their quantized form as charge. As a very recent appearance in the conceptual scheme of things, science made up definitions for charge and flowrates of charge.

2.2 Simple Examples Of Neglected Measurement Units

For reasons known only to American educators, pupils in grade school are taught that mathematics is difficult and that they should be afraid of it. To mitigate this intimidating introduction, measurement units which properly go with numbers are almost completely neglected. NO UNITS WERE EVER PRESENTED ON GRAPHS IN ELEMENTARY OR HIGH SCHOOL MATHEMATICS TEXTBOOKS. Does anyone remember such a presentation?

2.2.1 Learning about the slope of lines in algebra I and II is easy to remember. The graphs were always depicted just as containing nothing but numbers, $Y = aX + b$ or $Y = aX^2 + bX + c$, where a, b, c, X, and Y had numerical values, only. With the emphasis on learning the forms, graphical appearances, and manipulation of such equations, a student was ever allowed to ask; How? Why? Can such operations be done? What is the justification which allows a or b to be blithely multiplied times X? The fact that they were related by common measurement units was totally ignored. Again, X and Y must refer to something meaningful or useful to humans. Otherwise who would have spent the time deriving the relationship, the equation between them? Briefly following this flow of thoughts, what was left out in the attempts to pacify young students' fear of mathematics can now be seen. Consider the polynomial form $Y = aX^0 + bX^1 + cX^2. + dX^3 + \ldots$ For this equation to make any sense at all, then 'a' has the (units of Y); b the (units of Y / units of X^1), c the (units of Y / units of X^2), d the (units of Y / units of X^3), etc.

This basic polynomial appearance is revisited later on. The rules are discussed for the measurement units which go with the constants in such equations. But without even going into these rules, even the equations presented in college textbooks are again seen to be somewhat mis-stated, shown without units in the drive for simplicity. Therefore part of the assertion in 2.1 above has already been negated. The constants found within equations do have units. That is, measurement units are absolutely necessary for the equations found in science and engineering texts, which are presenting information which can be applied or used for some purpose. Whether these units are ever specified or not does not matter. They must be there. The units of a, b, c, etc in the polynomial just discussed in their unspecified or open general state could be considered to be universal, generic, or meta-units. These could be place holders for distance, time, temperature, pressure, etc which have not yet been placed on scales. Only with the equations found in mathematics texts can the units of the constants be neglected, because these are only "practice" equations or at the advanced college level are equations for the purpose of learning about the nature of un-applied mathematics itself.

2.2.2 This discussion of the necessity of measurement units can be continued by returning to another very simple elementary and high school topic, trigonometry. Again as is found many useful discussions were left out. Trigonometry is of course used in the scaling of similar triangles, specifically right triangles. All technical persons, engineers, scientists, mathematicians, etc are familiar with the mechanics of using the required trigonometric ratios or doing the scaling that is trigonometry. Even cement masons building swimming pool decks for the wealthy know the ratios of the sides of 30-60-90 and 45-45-90 triangles from memory, without hand calculators. A person would think that very little needs to be said.

In the application of trigonometry a person needs to know the length of one of the sides of the triangle of discussion and the size of one of the non-right angles. Tables, long since formulated are referenced, or hand calculators are used to produce values for the trigonometric functions associated with the known given angle. The known length is then multiplied by the sine, cosine, tangent, etc of the known angle, to find the lengths of the other sides of the figure. This is simple. Further since this operation is just the application of mathematical tool, one whose use was long since been learned, no pause or thought is given to how can this be done? Why does what is being done have meaning?

First, trigonometric figures are often presented as being placed with the angle of discussion at the origin (0,0) of the two dimensional grid scale in use. Then somehow this unspecified grid scale is applied. The system could be considered to be radial-angular. Then the hypotenuse and the side along what would be the arbitrary starting polar line both would have a common scale or mapping, that of the radial axis. But what of the third side, the vertical leg? Is there any guarantee that its scaling is equivalent to that of the other two legs? The system could be considered to be rectilinear. Then additionally the assumption is needed that the axes are orthogonal, perpendicular, and more importantly that are both linear. Then the two sides adjacent to the right angle would have the same scaling or mapping. Again, what of the third side, the hypotenuse? There are no assurances concerning the scale upon which this side is to be placed.

Many hidden assumptions have been found and questions about this simple exercise of placing a three sided figure on a planar or two dimensional scale. What if the figure was not positioned with one angle at (0,0)? What if the scales were not linear, but instead were half order, second order, exponential, logarithmic? Many questions can be answered by again examining the use of the given figure. The radial line, the hypotenuse is always assumed to have one unit in length, or whatever concept the scale represents. This makes life easy. Scaling, making ratios, multiplying, or dividing by the numeric one is easy to do without accidentally creating any worries as to how or why this has been done. For this reason all tables in references, textbooks, build into calculators, etc are based upon this assumed measurement of one.

But what are the measurement units which have been left off the diagrams and out of the tables? Trigonometric tables are often thought of and referred to as not having units or as being unitless numerics. This is clearly false. Sine's, cosine's, etc, are clearly ratios. As already discussed, as such they represent a measurement ratioed or scaled by another reference measurement. For example with the cosine; to remember its determination school children are told; the cosine is the length of the side adjacent to the angle of discussion divided by the length of the hypotenuse. So the word used, but not emphasized, was length. This is clearly a unit of measure, just an arbitrary or unspecified one. The unspecified grid scales of the system into which the triangle has been placed could be referred to as having AMU's; Arbitrary Mathematical Units, locally Absolute Meta Units, Any place holder Measurement Units. These elementary mathematical concepts have been found to have had units, but these were neglected because they were universal in scope, generic, or represented unspecified meta-units, place holders.

Here the desire was to emphasize that numbers have measurement units associated with them. Here a quick look at a counter example is enlightening. This point is seen very clearly in one simple example. The sine of a 45_degree angle is 0.707. But what is the sin of a 45_blank, with no reference to a scale or to a parameter?

2.2.3 A final example is the essence of gross simplicity. Elementary children are taught one plus one equals two, and 2 + 2 = 4. But so as not to distract "mere children" at the wrong time of day, sentences are not verbalized such as 1 apple + 1 apple = 2 apples or 2 apples + 2 oranges = 4 pieces of fruit. Teachers would have been fired, if they had tried 2 Republicans + 3 Democrats = nothing, because they are not compatible in the same sentence or room together. So finally the first part of the assertion in 2.1 has been negated. Even simple numerics could have had and probably should have had measurements, scales, references, or units.

3 Ratios

Closely related to and intertwined with the topic of numbers, units, and measurements is the topic of ratios.

3.1 Mathematical Perspective

Beginning from the mathematical perspective, what is a ratio? A ratio is simply the result of dividing one quantity by another. To make a ratio, the variables or parameters do not have to be continuous or uniform. They do not have to have a 1:1 or even a meaningful relationship. There does not even have to be any relationship between the quantities or the scales that they represent. In short anything can be ratioed or scaled. One quantity is just divided by the another. What is found is that a ratio reveals nothing about;

1 The two quantities, once they are gone.
2 The scales of which the quantities were members.
3 What quotient other members of the scales might produce if divided.
4 The relationship between the quantities, except their numerical size on their respective home scales.

The one great advantage of a ratio is that two quantities on the same scale can be compared, practically mindlessly. But in terms of variables or parameters, what is meant by dividing a variable by itself?

More broadly than the mathematical definition of the ratio, intellectually all relationships are known to be inherently dualistic concepts. Something is referenced to something else. This something else is the comparator or basis. Without this reference the relationship under discussion becomes nebulous. One of the most common relationships in mathematics is that of the ratio. The ratio scales the immediate object or grouping of discussion to the size of a broader or more encompassing reference or basis.

A commonality is found between ratios and derivatives. The development and mathematical nature of derivatives is not delved into in this work, because the reader is assumed to know and understand this material. This commonality is important to remember in a technical setting. With derivatives, ratios, percents, in short any quotient, the denominator is that which represents the independent variable, the implicit variable, the reference, the basis, is the a-prior for the expression. The numerator is the dependent variable or explicit parameter. Statements of both are necessary for the expression to make sense or to have any valid meaning. In non-technical writings often this is forgotten. Often percents, ratios, are presented in advertising, politics, and other general public forums where the nature of the denominator is never stated. Frequently such presentations are just deceptions, presented as if they were sound academic statistics. The importance of not leaving out the nature of the denominator is seen later in this work. In the lepton report expressions are found of the form, a relative variable / an absolute variable. This results in the utter necessity of not leaving off the appended descriptors, relative and absolute in this work.

Another interesting feature of ratios should be examined. There can be what might be called simple ratios, where the measurement units of the reference are the same as those of the quantity being scaled. Usually such appearances are just called scalings or measurements. There can also be those ratios found in all engineering, scientific, and technical endeavors, where the reference or denominator has entirely different measurement units from those of the numerator. Below in the listing of various common ratios or measurement groupings many examples of this type of ratio are seen. These type ratios might be called parameter connectors to distinguish them from simple ratios. This verbalization is used in the reports on the analyses of measurement systems.

Another interesting point can be observed. Just because the measurement units of a "simple" ratio can be canceled, divided out, or thrown away, does not mean that this has to be done. In fact, if the units of a ratio where the numerator and denominator are from the same scale are canceled out, what is left is a hapless numeric, a sterile unitless value. As already repeatedly seen, though, this accusation of such a ratio as being unitless is somewhat bogus. There still is always some reference verbal handle as to what the numeric represents. Persons from technical societies have heard "statistic lie". Equally or worse yet, humans intent upon "proving" their political or religious viewpoint as "the correct one" frequently project their meaning upon such a hapless numeric. Persons in technical societies have also heard "liars use statics".

A disadvantage of ratios is that they are a single point snapshots, and may not hold in general. If the scales are non-linear, then they are guaranteed not to hold nor be generalizable. In fact ratios don't make sense or apply if the scale of either quantity is non-linear. If the unknowingness of what happens beyond a single point snapshot ratio is combined with canceling its units what is left is a seriously nebulous quantity of almost no value what-so-ever. This then can easily be viewed as meaningless, just a coincidence.

3.2 Measurements As Ratios And The Senselessness Of Throwing Away Measurement Units

From the perspective of relationships and ratios, all measurements in fact fit these descriptions. For example, an object which is 6 inches long has a length of 6 units as compared with the reference unit's length, which in this case is an inch. The fact that this measurement or scaling is a ratio doesn't become obvious until fractions result. A distance of 1/3 foot clearly shows that the specific distance under discussion has been referenced, scaled, or divided by a reference distance.

As can be seen, to have any meaningful form of discussion, all phenomena, whether physical or social, need to be describable or measureable in terms of agreed upon scales. Whether these scales are relative or absolute is discussed later.

The reference for a ratio can be anything but to be meaningful it needs to have something in common with the object of discussion. The comparing of unrelated propositions is left to politics and religion. In engineering and technical work the common concepts used for simple ratios or measurements are the quantities which have already been mentioned:

(N or n) the count of some discrete population
(N or n) can also be the count of some quantity which can be thought of as, or actually physically be, broken into a collection of smaller subsets.
(L or l) distance in space, length
(T or t) duration in time
(M or m) mass
(Q or q) charge
(Θ or T) temperature, related to a quantity of contained heat
cd, luminosity

Combining these basic concepts as multiplication products and division ratios, again many common forms of measurement result;

area	L^2
volume	L^3
frequency	1/ T
velocity	L / T
velocity squared	$(L / T)^2$
velocity cubed	$(L / T)^3$
acceleration	L / T^2
jerk	L / T^3
jounce	L / T^4
1st moment	M L
2nd moment	$M L^2$
momentum	M (L / T)
force	$M (L / T^2)$
heat, energy, or work	$M (L / T)^2$
"potential" energy	$M \times L \times (L / T^2)$, or (force x distance)
"kinetic" energy	$M \times (L / T)^2$, or (mass x velocity^2)
power	$M / T (L / T)^2$
concentrations	N /L or N /L^2 or N /L^3 or N / T
densities	M /L or M /L^2 or M /L^3
viscosity	M /L (1/ T)
pressure	M /L (1/ T^2)
mass flow	M / T
volumetric flow	L^3 / T

torque – using angular measure rather than linear measures
conductivity - of some quantity thru a given size length, area, or volume
resistance - to movement, or of a flow or of transference of a quantity
capacity - the ability to hold some quantity per some unit size "container"
measures of transfer or flux – of some quantity
thermal conductivity btu / (hr ft^2 °F / ft) or btu / (hr ft °F)

Again measurements obviously must refer to something. To attempt to make a measurement refer to nothing or to "un-scale" it is obviously futile and also seriously nonsensical. Specifically for this overall work, the measured mass of the electron and of its charge of necessity must refer to some scales. Which scales, absolute or relative, can be chosen but a magic wand cannot be waved and their sizing or ratio to some scale made to go away. Otherwise there would be nothing left to discuss. Another tragically illogical aspect of the perpetual harangue of both hypothetical and experimental physicists, "make it unitless" is obvious. If somehow the units, scaling, and/or reference parameters of a measurement are successfully taken away, then wa-la, its sizing has also been taken away and there is no number left. This was seen very clearly in Section 2.2.2, with the sin of a 45_blank. Such a unitless expression, even this simple, is meaningless.

As already seen measurement units such as length and mass refer to features and physical properties of objects and forms in the external world. Whereas ratios are human conceptual play toys. Ratios are not the objects and can never be. The physical world is the guide not the enemy. If an intense or paranoiac fear of units drives a physicist to destroy or throw away measurement units, then they have also thrown away their connection with the real physical world. They are left stewing in their own internal mental juice.

An analogy can be made here between numbers with measurement units and vectors. Any numerical value which is of much use in the engineering or scientific realms of practical endeavor must have measurement units or refer to scales in some manner. This is the same way that a vector must have its unit vectors or pointers associated with it. Take away the unit vectors **i**, **j**, **k**, **l**… from a vector expression and what is left is about as meaningless or useful as an engineering quantity without its attached references to L, T, M, and Q.

With the last quantity in the listing above, thermal conductivity, a final example is found of the silliness of insisting that like measurement units be canceled. In current up-to-date well respected reference books upon looking up the topic of thermal conductivity, both parametric expressions, btu / (hr ft^2 °F / ft) and btu / (hr ft °F) are freely used, sometimes even both on the same page. If further clarity is needed, then additional descriptors could be used to modify the parameters of distance, such as; $feet^2$-of-surface-area vs feet-of-thickness. Other similar legitimate multiple ways of expressing units for a parameter or quantity are found in many engineering contexts.

3.3 Ambiguity Created by Ratios Or Scaling

Another serious disadvantage of a ratio is the loss of information on dividing. The two quantities become one, along with their units. The same can be said about multiplication, scaling, reducing, etc or other such binary operations. What were the original quantities which were multiplied, divided, or otherwise mashed together to produce the single expression which is found afterwards? What did the originating quantities represent, meaning what were their measurement units? Specific examples of the ambiguity created by such mathematical forms can be seen.

As an example of the two common types of energy, work, or heat listed above can be examined. Both expressions ultimately have the same units, those of energy, but both represent utterly different quantities. The expression for potential energy originated from the concept of a now static mass which was moved a distance from a reference or base by an acceleration to its current resting position, M x L x (L/T^2). This expression could be thought of as internal energy or energy stored due to an object's position. Whereas kinetic energy refers to the concept of the effect that the velocity, of a currently moving mass or object, has or is perceived to have by an observer; M x $velocity^2$ or $M(L/T)^2$. This expression could be thought of as an outward or external expression of energy.

If an expression for the energy of the objects within a system or of the system itself as a whole, are verbalized but there is no other knowledge of the system as a whole, then there is no way to know which form of energy is being referenced. Further specifiers such as potential or kinetic are needed. This same ambiguity can be found in many scientific and engineering quantities. This can always occur when the measurement units are composites or groupings of the simpler concepts of distance, time, mass, charge, temperature, etc. And as just seen with the two forms of energy, usually all the various expressions or concepts are valid, often simultaneously and interchangeably.

What has been found is that in the engineering and technical arenas the whole idea or concept of ratios no longer holds. This is primarily because the value of ratios do not hold in general for parameters or scales which are quadratic in nature. In the engineering and scientific arenas the concepts of calculus, derivatives and integrals, come onto their own, and the idea of using simple ratios as having general meaning falls by the wayside. These calculus concepts or operations are not discussed in this overall work because the reader is assumed to have an understanding of such beginning calculus concepts.

4 Types Of Measurement Scales Or Units

As hinted at above, there can be different types of measurement units or there are different types of scales or systems in which measurements occur. The different types of measurement units of relevance to this work have differences in their scope or of their relevance.

4.1 Relative Measurement Units

First and most obvious are the measurement scales with which everyone is familiar. These are the common or relative scales. These scales have been dropped "somewhat randomly" into the broader measurement universe of discussion and their sizing or rate of expansion is likewise often totally arbitrary. Any values placed on these scales only have meaning when referenced to the the particular scale or grid system in use. Such values cannot reveal anything about the measurement system itself or universe of discussion. A classic example is a scale set up to display the completely arbitrary units of length, feet and inches.

What is sometimes forgotten is while the metric system, the SI scales of measurement, are logical and well organized, they too are based on totally meaningless or arbitrary scaling units. Modern science has formalized the definitions for the four quantities of relevance in this work; spatial distance, temporal duration, mass, and charge. Never-the-less, this is not necessarily the same as giving the scales for them any rational or absolute basis in terms of the greater design of the universe. The basic unit of measurement for the amount of distance in the SI system was based on the circumference of the earth running from the north pole thru Europe. This obviously has no relevance in either atomic physics or galactic astronomy. The unit of time was likewise based on a Terran-solar time relation of no relevance except to Terran beings.

Continuing, the unit or scale for mass was completely arbitrary. And finally although the quantity of electrical charge was defined in terms of these first three, this was a completely arbitrary definition. Anyway the only real purpose or use of the electrical charge definition was to scale or set a size for the quantity of charge contained by the electron. As is found in Report 3.3, Measurement Systems Bases, the SI scales for mass and charge were not totally arbitrary but were in fact linked to the other base quantities. But this distinction between totally arbitrary or linked quantities is not relevant to the discussions here.

Also a reminder is needed that there is nothing special about the SI set of units as a whole. This set is just a collection of several measurement scales cobbled together to make a coherent or consistent whole. Specifically, the fact that this grid work or framework is overlaid on the physical universe by physicists as their tool for discussion still does not make it unique or special in any way. Additionally, there is nothing all that complicated about this structure for measurement or referencing.

4.2 Absolute Measurement Units

The next type of unit with a greater scope of applicability are absolute units. The scales for these units have been pegged to some well defined benchmark of the system under discussion. And further this benchmark reveals something about the organization or structure of that system. Mathematically the base or reference of an absolute scale could be thought of as a lower boundary condition for the system under discussion. Examples for both the relative and absolute scales illustrate the point. The lower relative point for the Fahrenheit temperature scale was pegged to the most common and coldest substance scientists could find at the time, the freezing point of salt water, the ocean. Likewise the Celsius scale was suspended between the freezing and boiling points of pure water and was broken into a nice even 100 parts or tic marks. While these scales are useful chemists, they do not reveal anything about the nature of the topic of discussion, temperature. The absolute temperature scales, Rankine and Kelvin, were tied to "absolute" zero, the point at which all molecular motion ceases. This was done to give some sense or measure of heat or energy content, to which temperature is related.

Fortunately the parameters used in the gas laws, the relative and absolute units, have distinct names. There are Celsius and Fahrenheit temperatures of a relative nature and Kelvin and Rankine temperatures of an absolute nature. There are also pressure units of pounds per square inch_gauge (psig) and pounds per square inch_absolute (psia). But what can be done if these verbal distinctions do not exist, get blurred, or ignored? To distinguish between relative or common measurements and absolute ones, some extra verbal descriptor or adjective are required. Unspecified units could be allowed to stand for the common (local, measurement, normal, observation, regular, or relative) units. To refer to absolute units, a modifier with the unit name could be used such as; absolute, reference, structural, or system units.

The importance of flagging absolute units is that they reveal something about the world underlying the grid work humans have overlaid on top of it. Fahrenheit or Celsius can be used in everyday life and daily whether reports, but these do no good and cannot be used with the laws, formulas, describing the nature of gas interactions. With the gas laws values placed on scales that have some inherent linkage to the physical phenomena of discussion must be used. Likewise, the size of common objects, say the length of a cat, can be described just using the common distance measurements of feet and inches or meters. But absolute physics measurement scales must be used to make any meaningful sense of the physical properties of the elementary particles and wave forms.

From a philosophical view, the distinction as to whether a scale is relative or is absolute depends upon the topic of discussion or realm of investigation. How the scale relates to the topic of discussion is critical. When discussing objects in a room or daily life the common distance scales could be said to be absolute because they do in fact reveal something about the immediate world of discussion. In a grander or cosmological setting or a smaller subatomic setting the common scales could be said to be just relative, because they don't relate to the topics of discussion nor provide real structural information about them. Because there can never be a "one size fits all" neither for distance, nor for duration, mass, charge, temperature, etc, all absolute scales used in the "wrong" realm are relative. Inversely, all scales used in their intended realm are absolute.

This last point needs to be emphasized. Considering astronomical objects and events, human size objects and events, and atomic size objects and events all simultaneously, there are no "natural" units nor god units. No one system of scales or units is relevant to all times, places, duration and size realms. This is regardless of what the famous Max Planck and his cheering squads have said. Any hypothetical physicists who claims to have invented a system of god units is either kidding themselves, is self deluded, or else is intentionally self aggrandizing. Such a particle physicist would get highly upset if some astrophysicists made an analogous claim, that the scale and duration of the universe are the only natural or god units. Basing a grandiose system of units upon the size and duration of solar system or the sun or the size and duration of a hydrogen atom or an electron obviously is no better than upon the size of the earth, the length of a king's arm or nose, or the height of his horse. This is the old and perpetual attempt to escape from anthropocentric, geocentric, heliocentric, whatever centric problem, by going ever smaller, or larger, in the size and duration scales. The futility of such attempts is immediately obvious.

4.2.1 Absolute Physics Scales

The absolute scales which are used throughout this work are called Squigs Scales or the absolute physics Squigs scales. These absolute or "natural" physics scales are appropriate to the sub-sub-atomic scale of distance and time. These Squigs scales are based upon the measurement units put forth by George Johnstone Stoney in 1874. Except the Squigs scales have had his assumed 2 or 3 dimensional π constants removed.

The absolute units used in this work are defined as follows.

Table 2 Definition Of Absolute Physics Measurement Units

Quantity	Symbol	Input -- Exponents of Unit Combinations				Derived -- Exponents of Force Constants				1 Squigs or Absolute Unit = n Common or Relative Units	
		L	T	M	Q	G	ε_o	μ_o	e	n	reciprocal
Length	l_{Sgs}	**1**				**0.5**	**0.5**	**1**	**1**	4.893753×10^{-36}	$2.043422 \times 10^{+35}$
Time	t_{Sgs}		**1**			**0.5**	**1**	**1.5**	**1**	1.632380×10^{-44}	$6.126024 \times 10^{+43}$
Mass	m_{Sgs}			**1**		**-0.5**	**-0.5**		**1**	6.591572×10^{-09}	$1.517089 \times 10^{+08}$
Charge	q_{Sgs}				**1**				**1**	1.602177×10^{-19}	$6.241506 \times 10^{+18}$

Absolute distance = Squigs distance, $l_{Sgs} = G^{0.5}\ \varepsilon_o^{0.5}\ \mu_o^{1}\ e^{1}$ = 4.893,753 x 10^{-36} relative meters
Absolute time = Squigs time, $t_{Sgs} = G^{0.5}\ \varepsilon_o^{1}\ \mu_o^{1.5}\ e^{1}$ = 1.632,380 x 10^{-44} relative seconds
Absolute mass = Squigs mass, $m_{Sgs} = G^{-0.5}\ \varepsilon_o^{-0.5}\ \mu_o^{0}\ e^{1}$ = 6.591,572 x 10^{-09} relative kilograms
Absolute charge = Squigs charge, $c_{Sgs} = G^{0}\ \varepsilon_o^{0}\ \mu_o^{0}\ e^{1}$ = 1.602,177 x 10^{-19} relative Coulombs

The Squigs Scales have a basis or underlying rational similar to that used for the Stoney Units of physics and are derived in a very analogous manner. These units are derived in Measurement Systems Bases and thoroughly discussed in the three analyses of measurement systems reports. For the purposes of discussion here saying that the absolute scales are based upon the three universal force constants G, ε_o, and μ_o, for gravity, electricity, and magnetism and additionally upon the elementary charge e is sufficient. This choice of absolute units reveals something about the universe of discussion, the content of the physical universe at the subatomic scale. Returning to the original topic here the distinction between relative and absolute scientific quantities, this distinction is critical to any description or quantification of subatomic phenomena.

4.2.2 Confusion of Zeroed and Normalized Scales with Absolute Scales

The term absolute does not necessarily mean a system or quantity which refers to some zero origin as its base or lower reference point. At first inspection, though, most of the scientific scales appear to be so positioned. The scales for the two other quantities besides distance and time of importance in this work, those of mass and charge, are found to be zeroed. There can be zero mass and no charge within a system being discussed. The absolute temperature scales are referenced to no molecular motion or heat content. Absolute pressure is referenced to vacuum, the absence of any pressure. Continuing with the gas law, volume starts with zero size and moles start with having no contained substance. This zeroing is true for most of the other scaled scientific quantities.

Frequently local, common, or relative measurements are made "absolute" by "zeroing" them. For instance, the "local" reference for temperature, the freezing point of water, can be further referenced to "absolute" zero. Thermodynamic scales of heat content can always be referenced to solids at absolute zero. This practice though, usually results in quantities in the human environment of relevance having large and unwieldy values. For example the temperature for the freezing point of water on the absolute Rankine scale is 491.67 R.

In this context a subtle but important relationship between most of the common or relative scales and their absolute scientific counter parts should be noted. Scales such as those of temperature which were originally based around the physical properties of water or pressures as read by gauges have a special relationship with their absolute counterparts. The absolute scales are just extensions of the original scale and are not in fact new scales. Even though the absolute temperature and pressure scales have new names, they are the same as the original common scales which have just had their key base or lower reference point moved away, offset, from its original position. These offsets are such that now the scientists using these scales are happy, the absolute scales now start at some zero quantity. As just mentioned for the temperature scales this quantity is the hypothetical state of no molecular motion or heat content. For temperature scales this offset is not trivial, 459.67 degrees from the original zero of the Fahrenheit scale and 273.15 degrees from the original Celsius scale. Whereas the offset between the gauge and absolute pressure scales is a minor amount of 14.696 psi. The importance of this concept of one scale just being an extension of the other is delved into when discussing unit conversions later.

Usually some practical lower level is set as an "absolute" reference. For example the American Petroleum Institute, API, uses -200°F as its reference for thermodynamic quantities such as enthalpy. Likewise the American Society of Mechanical Engineers, ASME, uses the freezing point of water as its "absolute" reference for the Steam Tables. The JANAF Thermochemical Tables and the modern computer process simulators all use different base references as "zero" enthalpy. This practice of "quasi-zeroing" thermodynamic scales is acceptable because the "absolute" size of an energy content value is rarely ever important. In their use the primary important of thermodynamic quantities is the difference of a quantity at two different locations on some second reference scale such as temperature.

An analogy here would be the determining the length of an object with a tape measure which has had its first two inches broken off. An object's length can be determined on such a scale to be 6.5 inches. The numerical values on this broken scale must be remembered to be offset by two inches when making comparisons with other measurements of the same object with an intact tape measure. Both tapes show the length of the object of concern to be 4.5 units from the origin of their respective scales. From this slight digression, the importance is obvious of not confusing or linking the concept of an absolute scale or system of units with the idea of a measurement scale being zeroed or starting with a numerical value of zero.

Another common misconception is that of confusing absolute scales with those which are normalized. A normalized scale simply means one whose upper reference point is one unit in size, duration, or whatever on the scale. In the context of absolute physics scales, the scientists of the 1800's and 1900's attempted to make calculations easy by normalizing their proposed "natural" or god scales. This is meritorious in that they had no hand calculators nor computers to apply basic science or to make practical applications for the benefit of people. To normalize their scales they simply declared the base unit of size to be 1.0 unit. That is, the spread between the lower reference, always zero quantity, and the upper reference was to be 1.0 units. If a particular quantity was to used extensively, multiplying and dividing by 1.0 required no work nor hand calculation time.

Now this simplification can immediately be seen as meaningless. Normalization does not in any way make a scale god like, natural, nor absolute. Essentially all scales, relative and absolute alike, are normalized. The base unit of length in the American Industrial system is 1 foot. In the metric system this is 1 meter. The various temperature scales still use 1° of some particular designation as their division of discussion.

Further there is the warning that the process or assertion of normalizing a particular quantity comes at several costs. This simplification of resizing a particular physical reference to one unit of scale size can effectively throw away valuable information. Secondly the referencing to a specific physical property or phenomenon of a scale of importance which is used extensively in a particular field or context, itself involves an unstated assertion. That is that the property so referenced is the lynch pin to which all other relevant physical properties should be referred, are somehow related, or from which they ultimately can be derived. Thirdly as has happened so many times in the history of science, the zeroing and normalization of scales alike, frequently ends up showing that humans have not only under guessed where the end points of the proposed scales should be, they have seriously under guessed. For example the referencing of the base or the zero of the Fahrenheit temperature scale the the freezing point of salt water has been shown to be a serious under estimate of how cold materials can get. Likewise the referencing of the upper limit of the octane scale to the combustion of 2,2,4 trimethylpentane appears to have been an equal under estimation of how smoothly hydrocarbons can combust.

4.2.3 Analogies From Other Fields of Endeavors

This distinction between relative and absolute scales or systems should be emphasized one more time. By absolute what is meant is a scale or system which refers to the basic structures of the universe of discussion. For most technical, engineering, or scientific work systems are needed which have some built-in description of the framework within which the particular values of any parameter are to be placed. What is important is the organization, framework, or structure as opposed to, or as well as the content. Scales or values which refer to the structure are what are meant by absolute. Scales or values which refer to the content of a system, or variables which "play" around within a framework are relative. Several analogies or examples from diverse worlds of discussion illustrate this distinction

A good analogy is from computer science. There the distinction is made between pointers or system addresses and the particular values stored at a given address. The system address or pointer refers to a location within the inherent hardwired physical structure of the machine. The value at the address may change according to the system of counting in use; binary, octal, etc and according to the code being evaluated at any particular nanosecond.

A very similar distinction is found between a numerical value and position in the discussion of the transference of values between scales in Section 5. As is seen there the value of a quantity on a scale does not get transferred, but that its position is what gets mapped onto the new scale. This is because the position not the value carries some inherent information about the structure of the scale from which the number is being transferred.

Continuing, astronomers have long since done an excellent job of designating locations within the sky. These mathematical locations are absolute and stay put over time. They describe a background. The constellations which have floated thru a specific location over tens of thousands of years are of course important, but they are just the content of that location. Ultimately star formations are referred to by their location not by their immediate form, or appearance.

As a third example, the current radio media within the United States can be sited. Some persons get upset by the content of a particular radio program. Some persons get upset by the general lack of relevant or meaningful news content of the "news media". But attacking a particular show deemed to be offensive or lacking importance serves no purpose. The content of radio shows or lack thereof is just that, content. The effort to try to place this content on a scale of goodness or badness, relevant or senseless noise, is itself a waste of time. What determines this content is the structure of the current "news media"? Currently that structure has three dominant built-in features. The ownership of the communication media is overwhelmingly that of corporate ownership. Likewise the electromagnetic spectrum in the radio frequency range has been overwhelmingly divided up into corporately owned blocks or band widths. Thirdly the media's actual operations are almost exclusively viewed as commercial enterprise operations or as air time to be used for profit making purposes, not for educational, informative, or any other purpose. These structural features are what determine the content that some people might find to be offensive or meaningless.

As a final example, a very clear distinction can be seen between organization and content or between absolute and relative without even referring to any specific measurement arena. A movie house can be discussed or viewed from two different viewpoints. The structure of the building could be discussed, the nature of its projector, the quality of the screen, and the role of an observer. These are the structure. A discussion could be focused on the particular movie playing on the screen at a specific time. This is the content.

In this work concerning subatomic particles, wave forms, and universal forces, the focus should be on those things which are longer lasting, represent a general truth, and not just a specific event or form. The use absolute measurement scales and systems to describe the phenomena of concern are required.

4.3 Universal Measurement Units

Finally there is a third level of measurement units or scales. These are universal, independent of any measurement systems. As hinted at in Sections 2.2.1 and 2.2.2 of this overall discussion of units, these units of measurement could be referred to as abstract, arbitrary, general, generic, or unspecified. At this conceptual level, the particular units in use can be thought of as meta-units or place holders to be filled in later from some particular scale system. Instead of units these descriptors could more properly be thought of as parameters, properties, qualities, or quantities. The original list of quantities is returned to; distance-length, duration-time, mass, and charge (L, T, M, Q). Instead of representing a very high level of abstraction reserved for only those with PhD's, these most important units come from a simple conceptual level, that of grade school or high school mathematics, geometry, and science. At this level of mathematical simplification is where relationships can be found tying the particle and wave form properties to the real physical world.

As seen in Sections 2.2.1 and 2.2.2 a quantity with universal units and universal applicability is often thought of and referred to as unitless. As as clearly illustrated, this was not the case and such view represented a conceptual confusion due to over simplification. Abstract, arbitrary, generic, or unspecified units are not the same as there being no units. The sides of a triangle used as a trigonometric figure and the constants of the equation $Y = mX + b$ had units. These were universal in scope. They represented or held the place for any or all units. Not only could these be though of as parameters, they might even be referred to as meta-parameters. The fact that the units assigned to the lengths of the sides of the trigonometric figure were from the same scale and were canceled does not nullify their presence or necessity. This practice of canceling the like units from some ratios was addressed in the section dealing with ratios.

Summarizing: A key word just used to describe the nature of scales is scope. Relative scales can be considered to measure or refer to the content or specific physical manifestation under consideration. Absolute scales can be considered to refer to the structure or world in which this physical manifestation is playing around. And finally universal measurements units refer to the overall mental construct from which both the absolute and relative scales derive their meaning. Each concept relative, absolute, and universal have a broader and broader scope.

5 Scale Construction And Measurement Unit Conversions

A discussion of the matter of unit conversions is required to give a full understanding of the topic of measurement units and scales. There are a plethora of measurement systems and scales used throughout all technical, engineering, and scientific work. These are both of the relative and absolute nature. As is obvious there needs to be means to convert between measurement systems.

Before discussing how to get from one scale to another, first how to construct a scale needs to be known. How are scales constructed, or at least the most common ones? The most common scales are linear. This is because they are the simplest to construct, use, understand, and a lot of common physical phenomena behave in a linear manner. In the technical, scientific, and engineering realms there are many phenomena which need to be described and which behave in non-linear manners. In these realms there are a plethora of phenomena which behave in other manners, such as; Second order or quadratic, polynomial, half order, inverse quadratic, exponential, logarithmic... There can be quadratic, exponential, and other such scales. As is often found in the fitting of curves associated with these non-linear phenomena or in the statistics dealing with them frequently there are major mathematical complications. Sometimes for these phenomena exact analytical mathematical tools are not available at all, and may never be. This is due to the inherent nature of what is being described. Fortunately none of these non-linear scales are required in this work. Attention can be focused on the nature of linear scales and transferring values between them.

For linear scales there are two requirements. Two bench marks are needed or reference points against which a given physical phenomena can be pegged or tied to any scale of units. How a linear scale labels these two reference points must be known. That is what numerical values a particular scale places upon them. From this the number of divisions or hash marks on the scale between the two references can be determined. This information relates to the rate of expansion, scaling, sizing, spread, step size, or other such expressions. These two references do not have to be the extremes for which the scale is used. In fact, historically many scales started out with what was thought to be bench marks at the extremes of the phenomena to be measured or described, only to have other either greater or lessor data be discovered later on after the scale had been established.

Obviously to transfer numerical values from one scale to another, the same information needs to be known about how each scale is constructed. Specifically the same two physical bench marks need to be labeled on each scale, even if both scales were not constructed around the same two reference points. Finally one scale needs to be designated as the a-priori, given, or giving rise to the independent variable. Values on the other then become the dependent, derivable, or wanted variable. Finally a value is needed on the originating scale which is to be transferred or mapped onto the receiving or new scale.

Mathematically the process of getting to one scale from another is same as that used for interpolating between values in a tabular listing. Just as linear scales have been specified here, care should be taken and interpolation specified as linear or not. This is because there are three point, five point, and many other interpolation techniques. This is without even getting into two dimensional mappings; rectilinear, polar, non-orthogonal, etc. Just as with interpolation, the numerical value of the base or lower bench mark on the originating scale can be numerically less than or greater than that of the receiving scale. The mathematical procedure is identical. Likewise which scale, originating or receiving, has the greater or lessor spread does not matter. What is found is that these procedures or techniques of converting a value from one scale to another are totally general. The only restriction or requirement was that both scales have to be linear. Other issues such as the scope or nature of the scales, relative or absolute, do not matter.

Typically the numerical device for getting from one scale to that of another system is called a conversion constant, but this label is not self explanatory. There can be conversion factors meaning multipliers, and also offset adjustments meaning addition constants, and there can be both in the same transference of values from one scale to another.

The mathematical procedure is simple. The location of the value or point being "converted" must be found relative to the two bench marks on the originating scale. This point does not have to be between the two references, but can be above or below the range numerically set by them. This location needs to be found as ascending from the lower reference or as descending from the upper reference. For example a value of 77 on a scale running from between the two references 32 and 212 is 0.25 of the way from the lower reference 32 to the upper reference 212. Once this relative location is established, no more use of the originating scale is required. This relative location of the value being transferred is now applied to the new or receiving scale. On a scale running from 0 to 100 for the same two references with which were originated, the relative position of 0.25 from the lower towards the upper reference is the value 25.

If the following notations are used as subscripts to keep the equations short;

U – common Upper reference location, physical benchmark or phenomenon

L – common Lower reference location, physical benchmark or phenomenon

I – Independent or Originating scale

D – Dependent or Receiving scale
Then mathematically the require procedures are;

For the ascending technique;
Original Relative Position = (Value of Concern – $Reference_{LI}$) / (Ref_{UI} – Ref $_{LI}$)
Value on Dependent Scale = $Reference_{LD}$ + Relative Position x (Ref_{UD} – Ref_{LD})
Where (Ref_U – Ref_L) is just rate of expansion, scaling, sizing, spread, number of steps between the two common reference points on the respective scales.
Or compressed into one equation
Value on Dependent Scale = $Reference_{LD}$ + (Value on Indep Scale – Ref_{LI}) x ($Spread_D$ / $Spread_I$)

Or equally for the descending technique;
Original Relative Position = ($Reference_{UI}$ – Value of Concern) / (Ref_{UI} – Ref $_{LI}$))
Value on Dependent Scale = $Reference_{UD}$ - Relative Position x (Ref_{UD} – Ref_{LD})
Or compressed into one equation
Value on Dependent Scale = $Reference_{UD}$ - (Ref_{UI} – Value of Concern) x ($Spread_D$ / $Spread_I$)

Breaking these final expressions apart the new value is found to be the sum of two terms. These equations for converting values, or more correctly transferring or mapping, them between linear scales, themselves have linear appearances, the famous Y = a + bX. What is found is that the originating value is not converted, transferred, nor anything else. The originating value doesn't do anything except to get eradicated. The relative position of the originating value is what is mapped into the new system.

The first term, consisting of a single factor, has the units of the dependent or new scale, as required. Basically this first term is an offset adjustment tying the value being transferred to the new scale's lower reference point for the ascending technique. Of course this tying is to the receiving scale's upper reference point for the descending technique. This is the additive version of creating what you want from what you've got; add what you want, the new scale reference, to the value that you have and subtract what you have, the given scale reference.

The second term consists of two factors. The units of the first factor in this second term are those of the independent or originating scale. The second factor of this second term is what is commonly referred to as a conversion factor. This whole second term is basically just a rescaling or resizing of the position of the value of concern by a scaling constant. This is the notorious; multiply by what you want, the new scale sizing, and divide by what you've got, the given scale sizing. This second factor serves two purposes. This factor provides the necessary scaling, shrinking or expansion, between the two scales. And equally importantly this second factor converts the units of the entire second term to those of the dependent or receiving scale. This unit conversion is true even if the numerical value of this conversion factor in the second term is 1.0, as is true in the special case 4 following. In this special case, this conversion, receiving scale units / originating scale units, is necessary to give correct mathematical meaning, but often gets blithely forgotten.

There can be several special cases or simplifications for this procedure.

1 When the lower reference for the independent or originating scale is zero.
Value on Dependent Scale = $Reference_{LD}$ + Value of Concern on Indep Scale x ($Spread_D$ / Ref_{UI})
This technique applies for the common conversion of going from temperatures in Celsius to those in Fahrenheit.

2 When the lower reference for the dependent or receiving scale is zero.
Value on Dependent Scale = (Value of Concern – $Reference_{LI}$) x (Ref_{UD} / $Spread_I$)

This technique applies to the common conversion of going from temperatures in Fahrenheit to those in Celsius.

3 When the lower references on both scales equal zero.
Value on Dependent Scale = Value of Concern on Indep Scale x (Ref_{UD} / Ref_{UI})
This technique applies to virtually all the unit conversions between American Industrial units and metric units. This is because all such common scales or measures for distance, duration, mass, charge, volume, contained moles, etc are zero based, have lower references of zero. Additionally, when listed in reference tables the upper reference of either the origination or of the receiving scale is set at an arbitrary numerical value of one unit.

4 When both scales have the same step size or the same number of steps between their upper and lower reference values.
Value on Dependent Scale = $Reference_{LD}$ + (Value of Concern – $Ref_{LI)}$ x (1.0 Dep units / Ind units)
This technique applies to all those scales in which one is just an extension of the other, as is the case of many relative-absolute scale pairs.

Because the nature of the scales specified in both 3 and 4 are common, then their shortcut or simplified formulas are also in abundant usage. These two cases are so common that the full or entire mathematically correct technique to get from one scale to another is often forgotten, or as is more likely the case is just never taught nor learned.

This full picture of how to convert the units between two linear scales needs to be remembered. What is found of importance in this work is, to get from the relative or common SI scientific scales to the absolute Squigs counterparts, the conversion factor or multiplier is what is of importance. This is distinctly different from the temperature conversions from relative or common units to their absolute counter parts, where only the additive offset adjustment is important. The way to keep straight as to what is needed is by using the units, not blithely throwing them away. In the context of unit or scale conversions, units are our friends.

Special case 3 above leads to some interesting extensions. The conversion constant between the relative temperatures, Celsius to Fahrenheit of 1.8°F / 1.0 °C has the same numerical value as that between the absolute temperature scales, Kelvin to Rankine, 1.8°R / 1.0°K. This is of course because these two absolute scales are just extensions of their relative counterparts. What is interesting and useful in this work is that although the absolute physics Squigs scales are not extensions of the common SI scales, this same commonality of unit conversions holds. That is, when the relative SI scales are converted to any other equally arbitrary system of relative units, there is the same sizing relationship between their respective absolute counterparts. This is discussed more fully in the three reports on analyses of measurement systems.

One final example of unit conversions should be investigated to highlight the necessity of remaining alert, especially when over simplification is being employed, for the benefit of the "common" person. An example can be found with which everyone is very familiar, but which technically is done poorly and quasi correctly. This is primarily due to the interaction between humans, their politics, and the physical world. There are two common systems of measuring or supplying human units to time. There is the calendar or Terran centric system, based upon or referencing the Terran revolution about its own axis. The SI second is set up to be the reference for the smallest subdivision of this system. There is also the solar centric system referencing the Terran revolution about the sun. One calendar day is equal to 0.999316 solar days. Instead of adjusting between these two measurement systems though by the mathematically correct procedure of multiplying or extending the calendar day by 1.000,684,932 calendar days per solar day, a weird process is used of adding one calendar day every four calendar years. Because this procedure appears to work and also because such procedural mechanism satisfies various personal and political sensibilities, the population of the modern world is lulled to sleep. To wake up again, all that is needed is consideration of any of the other planets in the local solar system. This bogus procedure or an attempt at an analogous process just won't pass muster. Some planet's days are on the order of scale with that of their years. For one planet Uranus, whose rotational axis points at the sun, the Terran concept of days and nights make no sense at all. One side of the planet is always light and one always dark even though many revolutions of its equator may pass.

6 Dimensions

6.1 Dimensions Of Constants, Variables, Parameters, Units, And Arguments

Referring to the discussions in this report and to that of the mathematical modeling of systems, there is one topic which immediately comes up. This is, what are the variables or parameters which are to be used in a model? With human scale physical systems the choice of parameters is usually obvious. What is not obvious is a system approached whose nature is not known, such as the structure of the electron? A brief example regarding dimensions, variables, parameters, and units shows that there are essentially no constraints upon them.

Suppose a 3d structure is being modeled with the variable F(r), some function of the radial distance from the origin. Suppose further that this variable represents the parameter energy squared, which has the units $[M(L/T)^2]^2$. So as seen there are 3 spatial dimensions, 1 variable, a parameter squared, and a mess of units are found. As seen there is not a 1:1 mapping between these related quantities.

Further there does not have to be an integer correspondence, or even a linear one. What there does have to be is some logical reasons for the choices of constants, variables, parameters, et cetera. For this work the focus was maintained upon the most essential or basic units which humans and particles experience; distance-length, duration-time, mass, and charge (L, T, M, Q).

Another closely related topic or word is argument; as in, the argument of the function F(r) used above is the independent variable r. Again, this word is not confused or equated with spatial dimensions. Consider for a minute asking a drafting program to draw a circle. Many items, arguments, must be specified or the program specifies them by default. For example;

The circle radius
The line thickness, style, color
The fill uniformity, hatch nature or style, color
The paper, whether it has glossy or matt finish
With color both the concept of hue or shade, and that of intensity, brightness, or density must be specified.

Further all this is without even referring to the location of the circle on the page or anything about the nature of the other objects in the drawing around it. But the object is still only a 2 dimensional circle. A mathematician or physicists may say this is cheating. The only items ultimately related to the intrinsic circleness of the circle are; its radius, its circumference, again referring to the line or curve, and its area, again referring to the fill. OK, but this is still 3 parameters for a 2 dimensional object. Finally at complete simplification, since the circumference and area are both mathematically dependent upon the radius, the only ultimate independent variable is the radius. One parameter for a 2 dimensional object.

What is found in the report mathematically describing the leptons, there are well over two dozen arguments needed to specify the area that a computer program is required to integrate for the mass density function. Some of these arguments turn out to be constants, some variables, and some are types of mathematical functions. But when the research on this project was started there was no way to know which was what and the programming language did not care. The macro routines would not accept more than 24 arguments attached to a function. And all this was for a 2 dimensional object which rotates with time into 3 dimensional space.

6.2 Dimensions And Dimensionless Numbers

Most people can keep the intertwined and somewhat interchangeable concepts of constants, variables, parameters, units, and arguments straight in their heads. But the concept and usage of the word dimension is involved in some serious muddles.

For example, in a hold over from early mathematical perspectives on engineering, discussions and even chapters are found in first semester engineering texts and reference books with the title of "Dimensional Analysis". For example in one current engineering reference book under the section on mathematics there is a listing of 16 dimensionless groups. In a later chapter on fluid and particle mechanics there is a listing of 20 dimensionless groupings, with an overlap of only 3 from the previous listing. There are yet the chapters on heat transfer and mass transfer which have their own such listings. To show the promulgation and plethora of such unitless groupings, the reference section in the back of one equipment manufacturer's catalogue lists 140 such ratio blocks under the title of dimensionless numbers.

In these engineering contexts what is meant by the use of the words dimensional analysis is an analysis of the parameters, and their units, associated with particular grouped engineering quantities. There is no pretense what-so-ever that what is meant by the use of this word is spatial dimensions as just used in the last paragraph above. To make these "dimensionless" (unitless) groupings the universally used mathematical tool is the ratio. In such ratios, again universally, a specific parameter or meta-parameter referring to some feature of the system under discussion is divided by another such unitwise identical parameter referring to different feature of the system.

For example in fluid flow frequently a force referring to one property of the material in the system or one feature of the system itself is divided by another force referring to some other valid aspect of the system. For example the heavily used Reynolds Number = the inertial force / viscous force = $(\rho \text{ d u}) / \mu$ or the Prandtl velocity ratio = $(\text{ inertial force / wall shear force })^{0.5}$ can be found. Yes technically the units of such expressions can be divided or canceled away since both the numerators and denominators express or represent forces. But they do not represent the same forces or quantities. A quantity is not being divided by itself from some other location or time within the mathematical fluid element. And as already repeatedly seen, such groupings still have names and still refer to something concrete and real.

With heat or mass transfer dimensionless groupings, one rate or description of transference is divided by another such quantity. Throughout engineering situations are found similar to the example of thermal conductivity discussed in the Section on Ratios. There one unit of length in the expression was or could be divided away or canceled by another unit of length in the same expression. There although both units were of length, one represented a length perpendicular to the other. The second was embedded in a square surface area.

Here with "dimensionless", measurementless or unitless, numbers this concept is taken to the extreme. All of the basic parameters of distance, time, mass, charge, temperature, et cetera are intentionally set up to magically go away. In doing this a deceptive mentality is also set up that any numerical value can be introduce or imported with its units into a calculation, just for the purpose of destroying the units of another quantity, and declaring victory, having produced a "unitless" or "dimensionless" value. Technical persons obviously know better and do not go around introducing random or meaningless quantities in engineering or scientific calculations. But mathematically nothing prohibits anyone from doing so, especially if the only objective in life is to always force the appearance of "unitless" quantities. Care must be exercised as to what information is proper input for the realm of discussions and the scales which go with them. Unfortunately this practice of canceling units frequently leads to the false claim that the only universal numerical quantities are unitless numbers. There is a misguided urge in some realms of scientific endeavor to fanatically produce unitless or dimensionless numbers at all costs.

In terms of spatial dimensions, the vast majority of all these "dimensionless" groupings actually represent two dimensions, typically the cross section of a pipe or vessel or the face of a flat sheet of material. Occasionally the grouping models a three dimensional structure, such as a tower or a heat exchanger. Even after the units have been canceled away, the number still represents or models the original physical structure. There is no pretense that the object or system modeled has become a mathematical point, with no length, width, nor height.

The reason for creating such groupings is that they serve a useful purpose in engineering applications. Such unitless groupings are frequently used in process parameter correlations or graphs of such correlations. But there is no pretense that this dimensionless, measurementless, or unitless number still represents some single intrinsic property of the material in the system or some single mechanical feature of the system under discussion. In fact, only because the systems under investigation are complicated or have many describable aspects can such unitless numbers can be created. Further the equations where these unitless blobs are used almost always historically started out as correlations involving tens, hundreds, or even thousands of data sets. These "dimensionless" numbers were a way to distill all this vast quantity of data down into a mental concept and several numbers representing them.

In this work such "mathematical trickery" cannot be used. The given starting parameters are extremely limited; the masses of the three leptons m_e, m_μ, and m_τ, the Planck constant *h* of (ML)(L/T) for the photon, the charge of the electron e, and the three measured universal force constants for gravity, electricity, and magnetism, G, ε_o, and μ_o. Chapter 4.1, Methodology detailed how the mathematical research efforts of this work proceeded and the criteria for the objective mathematical descriptions. As clearly stated due to the inherent nature of this research, machine parameters more limited in scope than the particles cannot be invoked nor can anything be invoked which is more complicated than the objectives of this research. Something such as a collider or particle storage ring wall shear force cannot be used. Likewise the objective of this research is to mathematically describe an intrinsic property of a lepton, its mass, at rest in isolation by itself. Invoking something such an inertial force or viscous force has been removed from consideration.

Secondly as discussed in the three reports Analyses of Measurement Systems I - III, to produce the necessary scaling constants four of the given starting data items are needed. The three enumerated force constants must be combined to produce three of the absolute physics Squigs scales, and the charge of the electron is used to produce the fourth absolute physics scale. The scaling constants in this work are based in this absolute scale system. These scaling constants are necessary to turn the initial mathematical-geometric correlations into actual applicable equations. These constants scale the universal arbitrarily sized mental-conceptual mathematical-geometric part of the equations into the human system of absolute physics measurement scales. Any other inquiring species of beings would need to do analogous scaling to import the universal part of the equations into their system of absolute units. In terms of the discussion here, these requirements to make scaling constants further deplete the pool of data which would be available to make any measurementless or unitless mathematical blobs. Instead of tens of thousands of data points and dozens of parameters describing the system, only 4 isolated data points are left; 3 masses and 1 (ML)(L/T). These could be scaled or the masses ratioed into unitless numbers, but this would only result in relative sizings correlations, not equations. Finally in terms of practicality, there would be no purpose of turning any of this valuable and limited starting data into a unitless blob.

On the other extreme of this discussion of the concept and use of the word dimensions are the hypothetical physicists. They immediately equate the use of a unit or parameter with a spatial dimension. That is for every measurement unit involved in a topic, they insist that this is literally equal to or effectively creates a new spatial dimension. This credo that a measurement unit actually means a spatial dimension is what has lead to the talk of 9, 11, or 26 dimensions for subatomic particles. To those persons outside this closed and narrow field of thought, this amounts to serious conceptual nonsense. Can anyone explain to a sixth grade science student how conceptually fabricated, physically unreal, dimensions somehow create the real 3 spatial dimension physical world. This debate is of no relevance here, even if there can be such a discussion. But the readers of this work should be aware that this serious misuse or abuse of the word dimension is out there and does exist. In the work here the use of the word dimension is reserved for the common layman's sense of the word. This sense is discussed more fully in the report on Time and Space.

7 Short Topics Concerning Units

7.1 Humans As Translators

By extending the discussion of ratios and relationships an important, even key, feature can be found of the scientists' job as subatomic particle researchers. Scientists are to act as translators between what particles or wave forms understand and what humans understand. In fact this is a job for all technical persons, engineers, scientists, and mathematicians. That is, to bring the sense of the world there, from the viewpoint of the "objects" of the investigations, into here the human experience of the world.

As mentioned in several contexts, there are two basic human measuring sticks, time and distance. The many various schemes for quantizing these human concepts of time and distance do not refer to anything in particular. They just refer to attempts to quantize mental descriptions, concepts, or formulations of some human experiences in the world. If a particular unit of distance is applicable to a specific object, then often it is meaningless or unwieldy for the next one. Likewise if a duration in time nicely describes a particular event, then often as not it has no relevance to the next event. Human measurement units for time and space have limited portability.

Whereas the other basic quantities of measurement, mass and charge, are usually statements about intrinsic feature of external objects. At the subatomic physics level the measurement units of mass and charge are portable from one object to the next. Historically these measurement units have been references to collective grouping for which humans do or can not know the exact internal contents or the arrangement of the contents was too complicated to convey easily. This work shows that mass, kilograms, is associated in some unknown or not well understood manner with a measure of the quantity of encompassed or stabilized gravitational energy. Likewise coulombs are a measure of the entrapped or contained electromagnetic energy.

Flipping the experience of the world around to the world view of the particles, three basic parameters are found which the particles or wave forms understand, or are the only quantities which they experience. They, all of the particles, sense the gravitational force, quantized or entrapped as mass. For the neutrinos this is all that they "understand". Charged particles, the leptons and quarks, experience the electromagnetic force, quantized or stabilized as charge. And finally the quarks or colored particles experience the color force, stabilized as "white". This same hierarchy can be applied to the "moving" wave forms or mathematically open ended ones. The possible but unproven counter part to the neutrinos, the gravitons, might only experience the gravitational force. The photons, the "moving" counter parts to the leptons clearly do experience the gravitational force, even though they appear not to contain this force themselves. And finally the gluons do "carry" and experience color.

In terms of the discussions of measurement units, the color forces and their quantized or stabilized form "white" have not been definitively measured or quantized. There are no units for color. But should such a unit become necessary, this force would probably just be defined in terms of the already understood measures of energy, charge, or mass. This is just as the scale for charge was constructed from definitions based on the scales for time, distance, and mass.

What is important here is, that these forces are all that these particles sense in their worlds. They know nothing of and could care less about the human imposed measuring sticks of time and distance. If scientists researchers are to be translators between the world of particles and the world of humans then such investigators need to stand in the middle and understand both worlds. Their "speech" probably uses or contains semantic translations between the units of importance in particle sense to units of importance in the human sense. For example the use of mathematical bridges or parameter connectors might be expected such as; M^1 / L_radial, Q^2 / L_radial, $color^3$ or W^3 / L_radial.

Referring to the discussion of ratios, there the denominator of ratios were found to be the reference or basis. In the case of this work, the new item of the particle's experience when spoken of is referenced to the human experience. The experience of the particle is imported and compared with a parameter which humans understand. The resulting mathematical expression is a particle property divided by a human concept. In the cases of this work this human measuring stick is always be a unit of distance. Later is the work centered around the pure forces themselves, the importance of the order or what is a-priori is seen when referring the two human measuring sticks to each other. A full discussion of this order of referencing distance to time is found in the report on Time and Space.

7.2 Verbalization Of Expressions With Units

There is a final matter which that should addressed. This is, how should variables and parameters be called or verbalized? How conceptual objects are verbalized both reflects and also shapes the thinking of scientists. For example, how are the following quantities spoken about; 5.245406×10^{-3} C^2/m and $1.861432 \times 10^{+5}$ kg/m? Are they called and thought of as numbers with units attached. This would reflect the thinking of physicists who view the elementary particles as mathematical points with spin, mass and other properties attached, as if they were not real, just listings in a table. These quantities could be viewed as ratios of several values which have been simultaneously placed on several scales. This would make them into variables, parameters, or parameter connectors. Or finally they could be viewed as just quantities, the numerical part and units as an un-separable whole. This last view reflects real tangible or physical objects upon which human are only attempting to put a description. None of these ways of verbalizing these quantities changes their value what-so-ever, they are only different views. But the view is what may be critical in scientific investigatory efforts to gain information about the world of the particles and wave forms.

CHAPTER 3.2 ABSOLUTE MEASUREMENT SYSTEMS - EXAMPLE OF USAGE

1 Introduction & Scope

This report discusses some specific preliminaries that set the stage for the focus of the work in Part 3. This work of course is to investigate the mathematical-geometric aspects of both the leptons and photons. These wave forms (particles) need to be considered from a view which includes both the numerical and units aspects needed to make complete equations. A beginning is made here by demonstrating a side-by-side example of the use of absolute measurement systems from two well known and understood set of scales. For this purpose relative measurement units and absolute units are used from the American Industrial, AI, and metric SI sets of scales.

2 Demonstration Of Using Comparative Measurement Systems

Previously in Measurement Units & Scales the importance and utter necessity of the use of units was emphasized for any intelligent discussion that referred to anything which could be quantified or enumerated. A bridge needs to be built between this somewhat general discussion and the ultimate objectives of an analysis and applications of the absolute physics units or Squigs Scales. A concrete example is needed of an application of units, both relative and absolute, which is well understood and long accepted. For this purpose the gas laws of chemistry are used. The chemists have long since characterized the behaviors of gases and how they respond to changes in their environment. This interrelationship between the properties of gases are used here for the demonstration purpose. The objective here is not to teach chemistry, but to demonstrate some properties and applications of absolute unit or scales. Further this one baby step at a time approach towards the mathematics of physics particle wave forms should not be necessary. Never-the-less, numerous encounters with physicists who have had an utter distain for, lack of understanding of, and a refusal to use measurement units have made this intermediate step necessary.

3 Setup And Calculations

Step1: First two systems of units need to be chosen for a discussion of a scientific topic, gas behaviors in this case. Systems of measurement units are needed that are totally arbitrary but never-the-less where both ultimately can have absolute scope. Two systems are needed which are related thru the fact that both are overlaid upon the same physical topic of discussion. A meaningful discussion is not possible if both systems are utterly independent. But two systems are required which are not in any way intertwined other than thru their physical topic of discussion. And of course both systems should be specified as being complete, comprehensive, or all inclusive of the topic and which are self consistent. For the purposes of the demonstration here the American Industrial, AI, and metric CGS, systems of units have been chosen.

A brief reminder of the historical origins of the two systems is useful. The American Industrial units of measurement were of course derived from the slowly developed British imperial and corporate way of doing things. Whereas the metric system was started from scratch by Napoleon, a French emperor putting his imperial stamp upon science. Further this was during wars between the then two national arch enemies. For all practical purposes the scales of measurement between the two systems are related by random numbers. This lack of dependence of one system upon the other is a key component in the demonstration here.

Which system is the starting system should be decided. This is the system in which initially the topic's parameters are described or the data is measured. The AI system was chosen, since everyone knows that it is a hodge podge mess.

Step 2: The scientific topic's parameters need to be defined and specified. The behavior of gases is simple. There are four primary independent variables; P-pressure, V-volume, n-molar quantity of gas, and T-temperature. This is important to note. These four parameters are related or interlinked by one "law", a mathematical description of their behaviors which has one equal sign. Such a law is typical of many throughout all engineering and science. Specifically the gas law is typically stated as:

$PV = nRT$

This equation has one "parameter convertor" or correlation constant, R the gas constant. Knowing both how many variables and how many constants that are required to describe a system, the universe of discussion, is essential. This brief examination sets over-riding constraints upon what can be done and cannot be done with the overall system. Further, this equation using the gas parameter converter and its measurement units covers all the independent variables. If any three variables are specified, then the fourth is no longer independent but is totally determined. That is of course for the simple situation of ideal gases or gases under mild ideal like conditions.

Referring back to both Edgar Buckingham and the idea of proper constraints, this gas system can be said to have three degrees of freedom. If all 4 parameters are specified, then the gas system has been over constrained and the results produced are at odds with the real world. If only 2 of the parameters are specified, then a system which is still partially open is left. The statement of such a system is still partially general and has not completely fit it to any particular situation. This is OK. Another parameter just needs to be specified before the gas law can be applied to an actual specific real world problem.

This same analysis of degrees of freedom is necessary when the objective of this work is reached of determining physical property information for elementary physics wave forms (particles). For example, in particle physics 3 universally applicable force constants G, ε_o, and μ_o are required plus one other definition to describe the framework for the understanding of this realm. Attempting to leave G out of particle physics calculations would be like attempting to leave P or T out of the gas law.

From an historical perspective, this one gas law is actually a composite of several simpler gas laws that have been rolled together. These simpler historical laws each only partially covered the entire topic of gas behaviors. When discussions of the particle or physics waves are reached, this idea of simplifying or partitioning any final correlation constant may be useful to remember.

The nature of each of the variables describing the gas behaviors are well known. Pressure is defined in terms of its mechanical nature as force/distance^2, and ultimately in terms of base units as mass/(distance x time^2). Volume is simply, distance^3. The number of moles is simply an enumerated quantity, n in mass units. The nature of temperature and its various scales was discussed in detail in the previous report Measurement Units & Scales. All of these variables or their underlying parameters; distance-length, duration-time, mass, temperature - an amount of contained heat, and n - a sum, are fixed static quantities as was indicated in Measurement Units & Scales. These type quantities are of course of the nature which is desired in the work of this specific report as well as in this overall work. When the time comes to converting measurements of the topic's parameters between the two systems, all the conversions for these underlying units are well established and listed in virtually all engineering references and texts.

Unit or scale conversion constants require the understanding of the nature of all the measurement scales in both systems. All four of the scales are of course linear. The rigorous procedures of Chapter 3.1, Measurement Units & Scales, Section 5, for converting values between the two systems is to be used or referenced. Effectively two of the parameter scales are already absolute; volume and number of moles. This is in the sense that both scales are zero based, and zero serves to make them absolute in this context. These zero based scales also mean the "shortcut" conversions can be used between the two systems, as were described in Measurement Units & Scales. Copying from Measurement Units & Scales gives;

The following notations are used as subscripts to keep the equations short;

U – common Upper reference location, physical benchmark or phenomenon
L – common Lower reference location, physical benchmark or phenomenon
I – Independent or Originating scale
D – Dependent or Receiving scale

Shortcut Scale Conversion Rule 3: When the lower references on both scales equal zero.
Value on Dependent Scale = Value of Concern on Indep Scale x (Ref_{UD} / Ref_{UI})

For all of the conversions to metric from American Industrial the upper reference points are simply 1 unit on the initiation or measurement scale of concern. The equivalent metric size or value can be found in reference tables.

For Pressure P, atm = P, psi x (0.06805 atm / 1 psi)
For Distance D, cm = D, ft x (30.48cm / 1ft)
For Volume V, cm^3 = V, ft^3 x $(30.48cm / 1ft)^3$
For Molar quantities N, gmole = N, lbmole x (453.59gmole / 1 lbmole)
For Temperature a Kelvin or Celsius stepsize = a Rankine or Fahrenheit stepsize x (0.5555 °Kstepsize / 1 °Rstepsize)

Pressure and temperature both have and are typically described, measured, on relative scales, but do also have absolute scales. While the conversion of pressure and temperature as relative values between the two systems can always be done, these relative values and their conversions do not produce the desired correct application of the gas law involved. So rules are needed within each system of how to convert between the relative and absolute expressions. Both the absolute pressure and absolute temperature scales are just extensions of their relative scales. So both the absolute and relative scales have the same step sizes. Again what this means in the individual specific contexts can be looked up and how to convert between the two representations can be specifically described algebraically. Copying from Chapter 3.1, Measurement Units & Scales, Section 5, gives;

Shortcut Scale Conversion Rule 4: When both scales have the same step size or the same number of steps between their upper and lower reference values.
Value on Dependent Scale = $Reference_{LD}$ + (Value of Concern – Ref_{LI}) x (1.0 Dep units / Ind units)

First for temperature;
The lower reference mark on the temperature scales is +491.67 Rankine (absolute) = 32.0 Fahrenheit (relative). This gives,
T, Rankine = (Rankine ref = +491.67°R) + (measured T, °F – Fahrenheit ref = 32°F) x (1.0 Rankine units / Fahrenheit units)
or simply T, Rankine = originally specified T, Fahrenheit + 459.67
And for Pressure;
The lower reference mark on the pressure scales in Boulder Colorado USA is 12.28 psi absolute = 0 psi gauge (relative). This gives,

P, absolute = (Absolute ref = +12.28psia) + (measured P, psig – Gauge ref = 0 psig) x (1.0 Absolute units / Gauge units)
or simply P, psia = originally specified P, psig in Boulder + 12.28

Likewise for the metric counterparts cutting through to the simplistic expressions gives.
T, Kelvin = T, Celsius + 273.15
P, atm absolute = P, atm gauge in Boulder + 0.8356

Here one of the system basis has been specified that for the ambient pressure to be that of Boulder Colorado. This specification of the system basis needs to occupy a lot of thought and effort in the context of the absolute physics scales later in this Part of the collected reports.

These steps then enable the conversion from the relative to the absolute values for the originating system of units, American Industrial in this case. Once the absolute numerical values for the input temperature and pressure have been produced, then the shortcut conversion rule 3 can be applied as was done above to translate over to the metric absolute equivalents. This is again because now both the absolute temperature and absolute pressure scales, in both systems, are zero based. Then working backwards thru the conversion rule 4 to go from absolute to relative values in the metric system can be done if so desired. Or for the temperatures a more direct means is available of converting the relative value from the AI units to the metric units;

Shortcut Scale Conversion Rule 2: When the lower reference for the dependent or receiving scale is zero.
Value on Dependent Scale = (Value of Concern – Ref_{LI}) x (Ref_{UD} / $Spread_I$)

T, Celsius = (Specified temperature, °F – 32°F) x (100C units / 180F units)

Also, as a final preparatory step, the universal conversion constant in the chosen system must be adapted over to the other system.

82.058 (atm_{abs} cm^3)/(gmole °K) = 10.739 (psia ft^3)/(lbmole °R) x [0.06805 atm/psi x (30.48 cm/ft)^3] / (l/453.59 lbmole/gmole x 0.5555°K/°R)

Concluding the preliminaries a lot about the universe of discussion has already been learned, before any data has been taken or otherwise specified.

Step 3: Next what are the objectives should be decided and what data are going to be used to answer any questions or apply the gas law. For this example investigation of the relation between (V/n) as a function of (T/P) is an objective. (V/n) is the derived or dependent grouping of parameters. T & P are the independent variables to be measured or otherwise specified. Further an investigation of the reduced or scaled quantities of temperature and pressure is desired in this demonstration. So next knowing what is the material substance for the example becomes required. For this simple demonstration water vapor is used. To scale or reduce these two parameters some additional bench marks are required which are applicable to the specific substance. These references are of course the critical temperature and critical pressure of water.

For the example here the input data is arbitrarily specified as follows. Then the necessary simplified unit conversions are done.

Temperature, 650°F → 1109.67°R → 616.48°K
Pressure, 250psig → 262.28 psia → 17.85 atm_{abs}
Composition, 100% water
Additional references or input
Critical temperature of water, T_c_water 705.47°F → 1165.14°R → 647.30°K
Critical pressure of water, P_c_water 3197.85 psia → 217.60 atm_{abs}

Step 4: After all the preliminaries, the data is entered into the rule or equation form first given above and the gas law is applied to answer the intended questions. These were,

(V/n) = f(T, P, R) = R x (T/P)

Specifically;
American Industrial (V/n) ft^3/lbmole = 10.739 (psia ft^3)/(lbmole °R) x (1109.67°R / 262.28 psia) = 45.40 ft^3/lbmole
Metric (V/n) cm^3/gmole = 82.058 (atm_{abs} cm^3)/(gmole °K) x (616.48°K / 17.85 atm_{abs}) = 2834.49 cm^3/gmole

This is all very straight forwards. What is equally simple but much more informative in the context of the ultimate objective of working with absolute physics scales, is the calculation of the reduced temperatures and pressures for the hypothetical system of gas. For a pure component;

Reduced temperature = the system temperature / critical temperature of that constituent, in absolute units
Reduced pressure = the system pressure / critical pressure of that constituent, in absolute units

Specifically;
American Industrial T_r = 1109.67°R / 1165.14°R = 0.9524 °R/ Reference °R
Likewise P_r = 262.28 psia / 3197.85 psia = 0.0820 psia / Reference psia
Metric T_r = 616.48°K / 647.30°K = 0.9524 °K/ Reference °K
and P_r = 17.85 atm_{abs} / 217.60 atm_{abs} = 0.0820 atm_{abs} / Reference atm_{abs}

The 4 steps outline above are summarized in Table 1

Table 1 Demonstration Of Using Side-by-Side Systems Of Scales

Necessary Unit Conversions	American Industrial Units	1 AI Unit = X Metric Units	Reciprocals	Metric CGS Units
temperature	°R	0.5556	1.8	°K
	1 °F = 1 °R			1 °C = 1 °K
pressure	psi	0.0680	14.696	atm
volume	ft^3	28317	3.5315 x 10^{-05}	cm^3
mass	lbmole	453.59	2.2046 x 10^{-03}	gmole
Gas Constant, R	10.739 (psia ft^3)/ (lbmole °R)			82.058 (atm cm^3) / (gmole °K)
System Basis	American Industrial		Metric, CGS	
temperature base, Relative	32.0	°F	0.0	°C
temperature base, Absolute	491.67	°R	273.15	°K
ambient pressure, Boulder	12.28	psia	0.8356	atm_{abs}
Data	American Industrial		Metric, CGS	
T, relative AI input	650	°F	343.33	°C
convert to absolute	1109.67	°R	616.48	°K
P, relative AI input	250	psig	17.01	atm_g
convert to absolute	262.28	psia	17.85	atm_{abs}
Composition	100%	H2O	100%	H2O
T_c, Critical Temperature	705.47	°F	374.15	°C
convert to absolute	1165.14	°R	647.31	°K
P_c, Critical Pressure	3208.2	psia	218.30	atm_{abs}
Objectives	American Industrial		Metric, CGS	
(V/n) = f(T, P, R) = R(T/P)	45.40	ft^3/lbmole	2834.49	cm^3/gmole
$T_r = T_{sys} / T_c$	0.9524	°R / °R	0.9524	°K / °K
$P_r = P_{sys} / P_c$	0.0817	psia / psia	0.0817	atm_{abs} / atm_{abs}

4 Discussion And Analysis

Now having gone thru the demonstration of using side-by-side systems of scales, further examine should be done of what has occurred.

First as a reminder or summary, a distinct series of procedural steps was used.

1 The measurement systems were chosen.

2 The measurement systems parameters were defined, the nature of their scales, and conversions constants were generated between the scales of each system. Additionally almost as a side note, the systems basis were defined where necessary.

3 The objectives were decided and the necessary data was obtained or otherwise produced.

4 Then lastly in a side-by-side manner working within the two measurement systems was demonstrated.

Reviewing the actual calculations which were made, first the objective quantity (V/n). In this specific case the results are numerically different between the two systems of units. That is even though both were based on the same universal gas law, had the same input data, and were in absolute units. This is because in this application the objective calculation has been under specified. Only two of the three degrees of freedom for this universe of discussion have been pinned down.

In this side-by-side example the universality of importing numerical values from relative scales into absolute scales can be seen when further operations are the performed there. Given water vapor at relative process conditions of 650°F and 250psig$_{Boulder}$, these conditions are imported into absolute scales to produce 1109.67°R and 262.28psia. Referencing these values to others already within the absolute system of scales, the critical constants of water 1164.14°R and 3208.2psia, the scaled or reduced values of 0.9524°R / reference °R and 0.0817psia / reference psia are produced.

Metric unit process conditions of 343.33°C and 17.01 atm$_{Boulder}$ produce 616.48°K and 17.85atm$_{abs}$. Again referring to the critical values within that system of absolute units, 647.31K and 218.30atm$_{abs}$, reduced values of 0.9524°K / reference °K and 0.0817atm$_{abs}$ / reference atm$_{abs}$ are obtained.

The universality or measurement system independence of these operations of importing these relative values into absolute scale systems are clearly demonstrated. Identical "reduced" numerical values are produced. Ultimately something universal has been shown about the original data when it has been set into measurement systems which are related to its inherent nature.

It is important to note, that although these scaled or reduced quantities are typically listed and referred to as unitless, technically they do have measurement units, as shown. There are two ways of expressing the measurement units on the final temperature and pressure quantities. First is the usual method of dividing out, canceling, throwing away the measurement units. Second, the measurement units could be left and expressed as parameter / reference parameter or some other such similar form. In the usual applications of the gas law this longer form is not used because this serves no useful purpose. As is found in the discussions of scaled absolute physics constants remembering the distinction between various usages or expressions can become important or equally can become a distraction.

Canceling away the measurement units of simple ratios such as these "reduced" quantities leaves investigators blind as to the basis, reference, or denominator of the expression. Worse yet though, this practice frequently leads to the false claim that the only universal numerical quantities are unitless numbers.

The process water of the example system could have been referenced to the critical constants of ammonia. This again would have produced universal numerical quantities, nonsensical and of no practical application, but universal never-the-less. Because an absolute scale system that covered the subject of discussion was worked within the universal quantities were produced, and not because the measurement units of some quantity were canceled, or thrown away.

This last idea, referencing water to ammonia's critical properties, lead to a very powerful warning. Any numerical value with its units can be introduced into a calculation just for the purpose of destroying the measurement units of another quantity, and the "scientist" can declare victory, having produced a "unitless" sterile value. Engineers and scientists obviously know better and do not go around introducing random or meaningless quantities in otherwise useful calculations. But mathematically nothing prohibits this procedure, especially if the only objective in life is to always force the appearance of "unitless" quantities. Care must be exercised as to what information is proper input for the realm of discussions and the scales which go with them. This idea of meaningful input is discussed in detail before the calculations in the three analyses of measurement systems reports are made.

Quantities such as 0.952 above are universal and they have units, meta-units, as ratios in some absolute system of measurement, temperature in this case. This is clearly not the same as saying that they are unitless. The value 0.952 is called "reduced temperature". Otherwise there is no distinction between this value 0.952 and the value 0.0820, which has been distinguished or labeled as "reduced pressure". Without reference units, parameters, verbal or conceptual handles, both of these universal numerical values are meaningless and worthless.

This demonstration is concluded with an almost philosophical discovery. Once a quantity starts out with units, which all measured quantities do, then the fact that units are associated with the numerical value never goes away. To repeat, the units can never be taken away from a measured quantity, all that is done instead is to just substitute one set of units for another as the numerical value is resized or rescaled.

CHAPTER 3.3 MEASUREMENT SYSTEMS BASES

1 Introduction & Scope

This report analyzes measurement systems bases, specifically those which underlay the work throughout Part 1. First in Section 2 for comparative purposes there is a brief review several historical attempts at "natural" or absolute systems of scales. Discussions are presented as to what are some the underlying conceptual assumptions and weaknesses of these historical absolute scales. Then the system of scales which are used in this work is introduced. These are the absolute physics Squigs Scales. In Section 3 explanations are given about why the various choices were made for this absolute physics scale system and why the other preexisting absolute scale systems were rejected.

In Section 4 a very important topic related to the absolute scale systems is examined. This is the distinction between the number of underlying bases and the number of parameters or units that a measurement expression might have.

In Section 5 the hidden bases underlying the historical relative or common SI set of scales are delved into. Several underlying arbitrary Terran human definitional fiats and geometric assumptions are seen to de facto cross link several of the supposedly independent scales for length, time, mass and static electrical charge, (L, T, M, and Q). Sections 6-8 summarize the effects that these unseen bases have for both the relative SI scales and any absolute scale systems which derive from them.

In Section 9 a few final critical questions are asked concerning several of the bases of the absolute scale systems. These questions arise from the underlying nature of the force laws upon which the absolute scale systems are built.

2 Particle Physics Absolute Measurement Systems

2.1 Historical Research Efforts

In 1874 George Johnstone Stoney first proposed "natural" units for a system of absolute physics scales. His proposal was to base the measurement or sizing of the elementary physics properties upon the free space force constants of the three known forces of his time. That is; at the atomic scale of objects and events distance-length, duration-time, mass, and charge (L, T, M, Q) were to be scaled in comparison to combinations of the G, ε_o, and μ_o. As the fourth necessary bases for his scales he proposed the use of the elementary charge, e. This was so even though at time the particle that we call the electron had not yet been discovered and its definitive charge had not yet been measured.

In May 1899 Max Planck proposed his system of "natural" units applying across many of the emerging areas of basic physics research. His Planck Units, as they are now called, could be used to normalize the numerical values of the physical properties of many of the basic physical constants. That is those constants whose measurements had been formalized enough to begin considering them as part of a comprehensive unified system. This included measurements for both the particles known at the time and for various field calculations. Planck emphasized the universality of his units with the now famous statement,"These necessarily retain their meaning for all times and for all civilizations, even extraterrestrial and non-human ones, and can therefore be designated as "natural units"...". Like George Stoney before him, Planck based his version of "natural" units on the three force constants G, ε_o, and μ_o. For his fourth necessary bases, though, he referred to what became called the Planck Constant, the quantity of (ML)(L/T) associated with the photon. Again like George Johnstone Stoney before him Max Plank referred to and counted upon using a quantity which had not yet even been formalized, the Planck Constant this time, *h*, as it would become know as.

Both the Stoney and Planck Units included the concept of normalizing G, εo, and μo or setting their numerical values equal to 1.0 as the bases for scales of Length, Time, Mass, and Charge (L, T, M, Q). Both had similar habits of rolling εo and μo together into the speed of light, c. This then was raised to all sorts of hard to justify powers for various purposes. Both sets of these "natural" units also rolled various π constants into their normalizations, thru ħ = h / (2π) or else just with εo. These practices then automatically forced assumptions of 2 dimensional circular perimeters or areas or else assumptions of 3 dimensional spherical surfaces or volumes into the calculational mathematics of the physical properties being addressed. These assumptions could be broadened into 4, 5, 6, etc dimensions, but then the numerical multipliers for π for n-surfaces and n-volumes get to be very complicated and become weird odd-even series, as are seen in Towards A Periodic Table Of The Elements Of Physics (PTEP).

Following these two first pass attempts at defining absolute or natural scaling systems for atomic scale physical properties many other systems have been proposed. All of these "natural" scaling systems were oriented towards specific objectives, which ultimately for many of the systems was simply to make the mathematical calculations of various topics less cumbersome. All of these systems set the numerical values of various measured physical properties or phenomena to 1.0, to normalize them. Then the values of these same parameters L, T, M, Q at the human scale of sizes and events and for the familiar relative measurement systems fell where they fell. None of these measurement systems can in fact "prove" that they are "The" correct or definitive system for explaining atomic scale phenomena. There are; Heaviside-Lorentz units (rationalized), Gaussian units (non-rationalized), Hartree atomic units, Rydberg atomic units, Quantum chromodynamic (QCD) units, Geometrized units, Planck units, Stoney units, etc. Only the Stoney and Planck units are referenced here because to their close similarities to the choice of absolute scales for this work.

2.2 The Superiority Of Planck Units?

Absolute physics scales are a slippery business. The scientists-mathematicians-physicists of old, when the topics were young, attempted to develop what they claimed to be for-once-and-for-all god units or natural units. Often they, specifically Max Planck, did this by attempting to get rid of physical references, developing scales which did not refer to "anything".

Stoney, Planck, and the Irish, English, German, Polish and others European scientists severely disliked the expensive metal prototypes for the units of length and mass residing in a vault in Sèvres France. This is easily understandable. These countries had fought bitter wars with France less than 100 years earlier. The Napoleonic Wars of 1803-1815 and the France-Prussian War of 1870-1871 which lead to the deaths of so many fine young men were not to be forgotten easily. But there should have been an equal difficulty ascribing a mental-conceptual idea in the mind of a German scientist as being a better basis for a physical system of units. Equally taking the word of American inventors (Albert a. Michelson, Edward Williams Morley, Simon Newcomb…) that their measurements and patented devices produced the superior bases for describing all physical matter and phenomena also seems a bit arrogant.

For various reasons of conceptual preference, or just flat out self induced beliefs and blinders, scientists chose Planck's system as "superior" because it did not refer to real physical "objects", such as the electrons of Stoney. Planck instead referenced the photons, as if they were not real physical things. Therefore the Planck units were credited as being the most "natural" of all natural units. Obviously this was, and still is, a deluded conceptual pretense that the photons are less real or are not anything, just because they were moving waves of energy. Whereas and the electrons were and have been considered to be real physical "objects", things like BB's. As is seen in the lepton and photon reports both the leptons and the photons are de facto or at least mathematically can be described as, gravitational-electromagnetic wave forms. Both species need to be called "particles", "objects", "wave forms", or something else of equal substantialness. Otherwise both need to be negated as having any physical substance. Ihe idea of Planck's units as being superior or more natural because they are based upon the photons rather than the electrons is humorous verbiage.

Another reason for the rise to dominance of the Planck units was probably the already established dominance of the man himself and his employing institution. Max Karl Ernst Ludwig Planck was, and still is, loved and adored by the particle and theoretical physics communities. Max Planck was a "full" professor of physics at the Friedrich Wilhelms Universität in Berlin in the very powerful newly united German Reich. Whereas George Johnstone Stoney was "merely" an Irish physicist whose day job was as a civil servent for the Irish government, technically the United Kingdom of Great Britain and Ireland. He did his scientific work in his spare time. That is to say, politics everywhere, even in supposedly pure science and engineering.

This tug-of-war between Stoney's ideas and those of Max Planck was like those of any other academic or scientific idea which is chosen as superior today just because it comes from a particular person, department, or university. Obviously this was just as true in Planck's time as today.

In a typically scenario a powerful "full" professor within a department has all his subservient graduate flock write articles proclaiming the merit of his latest wild idea. Of course he includes his name as an author on these articles. He has his subordinates reference these articles in all future articles that they write. Further he has tacit agreements with his buddies in other universities that they will cross reference each other's articles and those of each other's lessor status minions. Ultimately the entire scenario is almost as crass as proclamations today that some consumer product is "better" than others. Obviously the reality is that this claim of superiority is only a fiction made up by somebody in the advertising department of the particular corporation that is probably currently strangling the market.

Finally some physics researchers like or prefer the Planck units because they can be used in discussions of relativity. This is because Planck favored the idea of action or motion and rolled this into his units thru the use of h. There is no argument with this preference, if in fact that is all it is, "a preference". Ultimately though any attempt to make a claim for these units as to their superiority, naturalness, god-ness is immediately met with the cold reality from the discussion of absolute units in the Measurement Units & Scales, Section 3.2. There the idea was laid out that there are and can be no absolute units or scale systems for all times, places, and more importantly for all size and duration realms.

2.3 Commentary, Editorial

The idea of trying to invent a basis for a system of scales for comparing or measuring the physical properties of subatomic particles or other such phenomena where this basis itself has no physical basis, prototype or object, is at a minimum a bit self deluded. There is serious self deception involved if someone thinks they can invent such a scale, any scale, that itself has no physical references. This is similar to attempts by hypothetical physicists today to get rid references to measurement units. That is, the current physics hypotheticans attempt to develop physics equations which do not refer to any scales, sizing, or duration, but which at the same time somehow can magically describe the real physical world.

In some ways the historical absolute physics scales are worse off than the more common or practical scales which only have real classes of objects, such as electrons or single macro prototypes in vaults, as their bases. These mental-conceptual absolute physics scales use multiple, 3 and 4, of measured physical phenomena such as forces as their bases. Each such phenomenon has a multiplicity of measurement units associated with it. Behind the ultimate measurement of such physical phenomena there is a plethora, even hundreds, of sub measurements all referencing scales of some type. The values of these 3 and 4 measured phenomena are then rolled together as composites in such a manner as to cancel all but one remaining scaling or sizing unit. The numerical values of the composites are then magically set equal to one to give a normalized value for whatever the remaining unit of distance-length, duration-time, mass, charge, etc. Such normalized unit bases for most of the absolute physics scales do not exist. They have no physical existence. They are all merely derived mathematical constructs. Of course this was exactly the objective of the inventors of these historical "natural" scales. Unfortunately though this also automatically leads to several self defeating drawbacks or conceptually fatal flaws.

The futility of attempting to escape from physical references by going to mental-conceptual references in the minds of some specially chosen scientists is immediately obvious. First these "objectless" bases and their scales can never be physically verified, since they are only mental-conceptual constructs. Second they can never be used to measure anything since rulers, stop watches, or even precision instruments cannot be made for mathematical constructs.

Thirdly all scales must ultimately refer to something for their bases, such as "objects" or forces. These somethings must be concrete and real to be useful and verifiable. These bases and their measurements must be reproducible from laboratory to laboratory. For this very reason G, ε_o, μ_o, h, c, e and many other physical properties and phenomena have been used over the years as the bases for the Stoney, Planck, and the other absolute physics scales. As is obvious the inventors of most of these scales have just substituted the use of physical phenomena, such as forces, for physical objects, such as electrons. This involves the obvious pretense that the measuring of physical phenomena is better than that of measuring physical objects. Both must be, and have been, measured by humans and their real physical machine extensions. Further without these machine extensions, human created devices, generating the forces or wave patterns that are to be measured there would be nothing to measure. Likewise without machines or instruments receiving these forces or detecting these patterns there would be no measurement. Again this entire measurement scenario involving laboratory devices, instruments, technicians, etc entails thousands of sub measurements each with its own errors.

This listing G, ε_o, μ_o, h, c, e is only a partial sampling of the many physical properties which have been used to construct absolute physical scales. Examining this list, though, a pattern is seen. The scientists and early physicists of the 1800's were in love with the vacuum. Now an obvious question can be asked which is both practical and philosophical. Is a measured property of free space, empty vacuum, any different from a measured property of a physical prototype, class of objects such the electrons, or any other energetic wave forms? A force propagating thru or existing in a vacuum is just as real as any other measured physical property or object. There is an even more philosophical problem. How can empty space be empty, if physical properties associated with it are being measured? Concluding; historically physicists have decided to set up absolute scale systems based predominantly upon measurements of forces in a vacuum, as if these forces are not real or physical things. Why they fell under this self deluded spell is not known, but these philosophical points can be argued here.

3 Absolute Physics Scales Used In This Work

For this work involving subatomic physics waveforms (particles) the absolute physics Squigs Scales or Squigs Units are used. These are shown in Table 1. Also shown for reference purposes are the Stoney and Planck scales. These historical "natural" scales are the two of most relevance or similarity to the absolute physics Squigs Scales. In fact except for the use of several π constants with the Stoney Scales, the Stoney and the Squigs scales are identical.

3.1 Examination Of The Choice Of An Absolute Physics Scale System – Geometric Assumptions

The choice of the bases for an absolute system of atomic and subatomic measurement scales is critical to any work involving subatomic phenomena. A detailed examination is in order as to why one set has been chosen over other historically already existing scales. Specifically in this case, why have the absolute physics Squigs scales been chosen over those of Stoney and Planck?

First what is needed is a discussion of geometries, assumed particle geometries or the lack thereof. A choice was made to keep all geometric references totally out of the absolute scales used in for work. There was no π's, related to 2d perimeters and areas, 3d surfaces and volumes, 4d surfaces and volumes, etc embedded in these absolute scale bases. As stated in Chapter 4.1, Methodology and Section 5.1 below, when this work was started no claims or assumptions were made about the structure of the grander universe. Nor were any presumptions going to be made about the spatial or temporal dimensionality of the subatomic particles and other wave forms. Aside from dimensionality, there were no assumptions in this work as to the mathematical internal versus external nature of the particles and forces. That is, assumptions were not made that either species, leptons and photons, can be mathematically represented by interiors (lines/curves, areas, volumes, n-volumes) nor necessarily by surfaces (endpoints, perimeters, shells, n-surfaces), etc. Likewise there were no assumptions as to the mathematical diffuse versus concentrated nature of the particles and forces. That is, assumptions were not to be made that either species could be mathematically represented by dispersed models nor necessarily by dense or point like models. Simply stated there were no assumptions as to the particles' structural natures nor even what spatial/temporal form that they might take. Certainly any such assumptions concerning spatial dimensionality were not going to be built into the absolute scale system.

Secondly there is plain simplification. In comparison to both the Stoney and Planck units, with the absolute physics Squigs scales there is no need to remember or mess with a bunch of π constants every time a reference is made to a distance-length, duration-time, mass, or charge.

Table 1 Absolute Physics Measurement Scales

Absolute or Natural Units	Exponents of Measured Physical Properties					Numeric Factor	1 Absolute Unit Combination = n Equivalent Relative Units		
	G	ε_o	μ_o	e	*h*	k		n	reciprocal
Squigs									
L	**0.5**	**0.5**	**1**	**1**	**--**	**1**	m	4.893753×10^{-36}	$2.043422 \times 10^{+35}$
T	**0.5**	**1**	**1.5**	**1**	**--**	**1**	s	1.632380×10^{-44}	$6.126024 \times 10^{+43}$
M	**-0.5**	**-0.5**		**1**	**--**	**1**	kg	6.591572×10^{-09}	$1.517089 \times 10^{+08}$
Q				**1**	**--**	**1**	C	1.602177×10^{-19}	$6.241506 \times 10^{+18}$
Stoney									
L	**0.5**	**0.5**	**1**	**1**	**--**	$(4\pi)^{-1/2}$	m	1.380502×10^{-36}	$7.243741 \times 10^{+35}$
T	**0.5**	**1**	**1.5**	**1**	**--**	$(4\pi)^{-1/2}$	s	4.604860×10^{-45}	$2.171619 \times 10^{+44}$
M	**-0.5**	**-0.5**		**1**	**--**	$(4\pi)^{-1/2}$	kg	1.859448×10^{-09}	$5.377940 \times 10^{+08}$
Q				**1**	**--**	**1**	C	1.602177×10^{-19}	$6.241506 \times 10^{+18}$
Planck									
L	**0.5**	**0.75**	**0.75**	**--**	**0.5**	$(2\pi)^{-1/2}$	m	1.616049×10^{-35}	$6.187933 \times 10^{+34}$
T	**0.5**	**1.25**	**1.25**	**--**	**0.5**	$(2\pi)^{-1/2}$	s	5.390558×10^{-44}	$1.855096 \times 10^{+43}$
M	**-0.5**	**-0.25**	**-0.25**	**--**	**0.5**	$(2\pi)^{-1/2}$	kg	2.176714×10^{-08}	$4.594081 \times 10^{+07}$
Q		**0.25**	**-0.25**	**--**	**0.5**	$(2)^{+1/2}$	C	1.875547×10^{-18}	$5.331778 \times 10^{+17}$

3.2 Continued Geometric Assumptions - The Force Law Equations

If an attempt is made to reason Stoney's and Planck's rationale for their use of π constants, what is found is that their absolute physics measurement systems were entangled with the equations for the force laws, or equally with the definitions of the three force constants. In the form into which the mathematics of physics had solidified at their time some glaring inconsistencies had already been created in the definitions of the three force constants. Statements of the force laws are seen following;

Newton's Law $F_g = G \frac{m_1 m_2}{r^2}$ (01)

Coulomb's Law $F_e = k_e \frac{q_1 q_2}{r^2} = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$ (02)

Magnetic Equivalent $F_m = k_m \frac{q_{m1} q_{m2}}{r^2} = \frac{\mu_0}{4\pi} \frac{q_{m1} q_{m2}}{r^2}$ (03)

Obviously all of these three force equations can be inverted so that the universal constants G, ε_o, and μ_o become the dependent variable of an exerted force. They can be turned into definitions for G, ε_o, and μ_o.

$G = F_g \frac{r^2}{m_1 m_2}$ which has the measurement units of $L^3T^{-2}M^{-1}Q^0$ (04)

$\varepsilon_0 = \frac{1}{4\pi F_e} \frac{q_1 q_2}{r^2}$ which has the measurement units $L^{-3}T^2M^{-1}Q^2$ (05)

$\mu_0 = 4\,\pi\, F_m \frac{r^2}{q_{m1} q_{m2}}$ which has the measurement units $L^1T^0M^1Q^{-2}$ (06)

where

G is the universal gravitational constant	6.672590 x 10^{-11} (m/kg) x $(m/s)^2$
k_e is called the coulomb constant	8.987,551,788 x 10^{+9} (kg m)/C^2 x $(m/s)^2$
ε_o is the universal electrical constant	8.854,187,817 x 10^{-12} C^2/(kg m) x $(s/m)^2$
μ_o is the universal magnetic constant	1.256, 637,061 x 10^{-6} (kg m)/C^2

The various physical measurements required (distance, mass, etc) can be made to determine the values of these constants. Historically this is what was done and the values shown above were derived. Since that time physics has glommed onto the use of the dynamic quantity the speed of light, c, and now always uses it as a means to define and/or calculate both ε_o and μ_o.

It is recognized that the above statement of the equation describing the magnetic force between two objects displaying magnetism is stated differently in almost every textbook and reference handbook that a person may pick up. A person should not get upset if someone else finds different presentations from the one found above. To cut down on further confusion pertaining to magnetism a reminder is needed that the objectives here are to discuss static not dynamic relationships.

What is found in the statements of these three static force laws or equations are horrible inconsistencies. In fact these three equations which define the three universal force constants are so non-uniform as to be humorously un-scientific. In some cases the measured universal force constants are in the numerator position and in some cases in the denominator position. In some cases there are π constants and in some case not. In one case the π constant is with its universal force constant and in the other it is reciprocally opposed to it. Never-the-less, for this work these definitions of the three universal force constants are used as is, as they currently are. This is how they have long been defined, used to measure both static and dynamic quantities, and used to calculate virtually everything upon which electrical engineering is based. So there is no point in messing with them, nor in trying to second guess their creators. The objective here is to discover equations describing several sub-atomic phenomena and not to reinvent half of modern science.

In the discussion of these three systems of absolute physics scales another reminder is needed. Both Stoney and Planck appear to have used the following definitions;

ε_o = what is now used as $4\pi\varepsilon_o$
μ_o = what is now used as $\mu_o / (4\pi)$

to create their scales. So in subatomic physics work not only can there be different conceptual or physical properties as a basis for absolute scales, sometimes even the very symbols themselves refer to different multiples of the same phenomenon.

Finally as is obvious any beginning physics student can ask, "Why the need for these 4π's"? Why do they even exist at all? Embedded in both the Stoney and Planck units and into the charge and magnetic force laws, Equations (02) and (03), there is seen de-facto mathematical irrationality as well as logical indefensibility. No sphere was specified in the statement of the force laws, only a radial distance between two points.

Who knows, after the next General Conferences of Weights and Measures scientists and engineers could be forced to use the 9 dimensional surface of the string physicists every time G is referenced. Incidentally such a 9 dimensional surface has the numerical value of (9 x 32)/945 x $\pi^4 r^8$ or $29.686580r^8$. This numerical quantity could be called the Bogosity Factor and the measured value of G could be ratioed by this amount everywhere that G is used.

3.3 Rejection Of The Involvement Of c

Returning to the choice of absolute interlocked subatomic physics scales, the definitions of the absolute physics Squigs units as stated above are used in this work. The use of the derivable and dynamic quantity the speed of light, c, is rejected. This quantity was favored by Stoney and Planck, again for various historical reasons. Actually both persons did in fact define their scales in terms of c. Above c has just been decomposed or had ε_o and μ_o extracted to make the appearances in Table 2 more analogous. The derivation of c from ε_o and μ_o needs no discussion.

$$c = \frac{1}{(\epsilon_o \mu_o)^{1/2}} = 2.99792458 \times 10^{+8} \text{ m/s in common or relative measurement units} \qquad (07)$$

The speed of light, c, is a derivable quantity and all three of c, ε_o, and μ_o cannot be defined simultaneously. To do so would over constrain the system, which happens to represent physical reality in this case. In this case ε_o, and μ_o are needed, as is, so frequently that back extraction of one or the other from c is undesirable.

What is seen in Table 1 above, is that if the quantity L/T is calculated by any of the Squigs, Stoney, or Planck systems of absolute units, then the same numerical constant $2.99792458 \times 10^{+8}$ m/s in common or relative units is obtained, as is logically required. What is also be found, as is discussed in the Section 4 below, this numerical value for the speed of light is totally irrelevant. Since this composite quantity only contains 2, ε_o, and μ_o, of the 4 system bases, then it is numerically measurement system dependent and not a universal numerical quantity.

3.4 What Is To Be Done Or Not Done With *h*?

Finally the objection to the use of *h* or *ħ*. In this work there are several primary objections of the whole Planck system of units.

First, in this work the concept of quantities is preferred, fixed or "static" packets of something. The concept of action, motion, or velocity, etc as was preferred by Planck is not used as a basis for the scales here. The topic of relativity is not addressed at all. The use of *h* is rejected as one of the basis for the absolute scales used in this work. Besides being a derivable quantity related to the intrinsic properties of the photon, *h* has a complex mess of units, similar to the multiplicities of units of the three force constants. Instead here e is favored which while it is also a derivable quantity, is related to intrinsic properties of the electron and other leptons and only has a single measurement unit.

Secondly the Planck system of interlocked units, while it may be complete or comprehensive and self consistent, it is only consistent with itself (sort of).

Examining the Stoney units or the almost identical absolute physics Squigs units, there is also definitional or calculational consistency. Using the absolute parameters of L, T, M, and Q as defined in the Stoney and Squigs systems various quantities can be calculated such as;

$L^3T^{-2}M^{-1}Q^0 = 6.672590 \times 10^{-11}$ (m/kg) x (m/s)^2 (08)
$L^{-3}T^2M^{-1}Q^2 = 8.854188 \times 10^{-12}$ C^2/(kg m) x (s/m)^2 (09)
$L^1T^0M^1Q^{-2} = 1.256637 \times 10^{-06}$ (kg m)/C^2 (10)

These combinations of unit parameters correctly reflect or reproduce the system bases as would be hoped and expected. Whereas applying these Stoney or Squigs bases to the quantity (ML)(L/T), the following is obtained

$L^2T^{-1}M^1Q^0 = 9.670{,}562{,}404 \times 10^{-36}$ (kg m) (m/s)
$\neq$ *h* the Planck constant = $6.626{,}075{,}5 \times 10^{-34}$ (kg m) (m/s) (11)

This is OK here since neither the quantity (ML)(L/T), nor the Planck constant *h*, are bases for these systems. The Planck constant has been measured to be what it is, in comparison to these other three quantities, forces in this case. The discrepancy between these two quantities is also the long accepted factor α, specifically 68.517... = 1/(2α). The photon report gives a mathematical demonstration for the origins of this factor. Both *h* and α are real quantities with real physical origins. Neither can somehow be magically made to go away. Normalizing one or the other just results in the loss of much valuable scaling information.

In Planck's system of absolute units, combinations analogous to those above of L, T, M, and Q do reproduce the three force constants as they are defined as that system's bases. Likewise using these parameters as they are calculated, *h* is also correctly reproduced. This reproduction of the system bases is required for any self consistent system.

The catch here on even considering either *h* or α as a system basis, is what can be done next? The quantity $L^2T^{-1}M^1Q^0$ was just calculated and resulted in two different representations, both valid. In the system of absolute physics Squigs scales the 9.670×10^{-36} version is obtained. In the Stoney system of units the 9.670×10^{-36} version is also obtained, just further divided by 4π due to Stoney's definitions of ε_o and μ_o. But in Planck's system of units a variant of the 6.626×10^{-34} version is the result. Actually $\hbar = h/(2\pi)$ is what is obtained there. So in the systems without *h* as a basis, variants of 2α*h* are obtained. In systems with *h* as a basis, variants of *h* are the result.

The first lesson to be learned, is obviously there should be no cross breeding between systems. But the question remains, even within a given system of absolute physics scales, which should be believed or attribute as being a-priori? For example, what if calculations are made of any of the quantities which follow.

$L^1T^{-2}M^1Q^0$ = force
$L^0T^{-2}M^1Q^0$ = force / distance
$L^{-1}T^{-2}M^1Q^0$ = force / distance^2 or pressure
$L^2T^{-2}M^1Q^0$ = energy
$L^2T^{-1}M^1Q^0$ = energy x time
$L^2T^{-3}M^1Q^0$ = power

or any other similar mechanically based quantity, whether relativistic or not, an indeterminate situation results. Which variant of $L^2T^{-1}M^1$ is going to be used as compatible with these new expressions? If the system basis *h* is used as the numerical definition of the combination $L^2T^{-1}M^1$, does this invalidate α*h*? If this combination is calculated as required from the individual definitions of L, T, and M, what is to be done with *h*? Until now physics has not had an answer to these questions, nor even any agreed upon attempts. The lack of an explanation for α has basically been ignored.

One way out of this mess for the Planck system is to also introduce α as another basis. But here in the context of setting up absolute systems of units to describe atomic and subatomic phenomena, there is a difficulty with introducing α as a factor or multiplier every time a reference to or use of *h* is made. This would give 5 bases G, ε_o, μ_o, *h*, and α for a system which only contains 4 unit parameters L, T, M, and Q. Whether the combinations ε_o and μ_o, or c and ε_o, or c and μ_o are used as the actual bases can temporarily be ignored. Two of the three are required. If α is introduced, the system of units has been over constrained. Otherwise, if α is not introduced, an indeterminate or inconsistent system results. To overcome this objection of 5 bases over constraining a system with only 4 measurement units the pretense could be continued that α is a unitless basis. But as is clearly demonstrated (proven) in the Analyses of Measurement Systems I α does in fact have units, long since ignored or completely misunderstood. It is a conversion factor, the result of importing relative or common measurement units into an absolute framework. The blithe, senseless, and also invalid canceling of its units has unfortunately long since confused and deceived hypothetical physicists as to the true nature of this constant.

Finally and maybe most importantly, whether the Planck system of absolute units is preferred or not does not matter. This system cannot be used. As one of the objectives of this complete work and as also calculated in the photon report, derivations for the possible the origins of both α and *h* are demonstrated. Neither can be used as a basis for the choice of absolute physics scales here, or else there is the risk becoming involved in circular self referential entanglements.

3.5 Concluding The Discussion Of The Absolute Physics Scale Systems

Concluding the Squigs units have been chosen as the absolute physics scales which are used in this work. Calculations of various combinations of L, T, and M, including *h* and α, fall where they may, if they are necessary. The a-priories in this work are the three force constants and the elementary charge e. Normalizing the values of physical phenomena just for the sake of making calculations easier is not an issue here. Modern hand calculators and computers do not care if a calculation is difficult.

As found in the several reports in Part 1 the absolute physics Squigs Scales are not only simpler than the Stoney and Planck Units, these scales more closely match the working definition of what an absolute unit is. A choice of "natural" or absolute units does more than just normalize certain quantities of the atomic and subatomic scale size or make calculations at the atomic scale simpler. As found in these reports in Part 1, this choice of absolute units does in fact indicate something about the universe of the discussion, the content of the physical universe at the subatomic scale.

Now the bases for an interlinked system of absolute physics scales has been chosen, the next step is actually applying or using this system of units for the discovery of explanations of measured atomic scale phenomena. This next step is started by showing how use, interpret, and not to misuse this system of absolute units in the System Analysis I.

Finally of great importance is the issue of how the system bases relate to the the measurement parameters. As seen in Table 1 there is NOT a one-to-one correspondence between the bases and the measurement units. This is very different from the parameters of temperature, pressure, volume, and moles discussed in relation to the use of the gas law in the previous report. This topic is examined in detail in Section 4, immediately below.

4 Distinctions Between System Bases And Measurement Units

There is another important topic to discuss before returning to mathematical-geometric and calculus derivations of the lepton and photon reports. This is an important distinction between absolute subatomic physics scales and other scales, either absolute or relative, as typically used in the remainder of science and engineering. This critical distinction requires a pause and thoroughly reflection.

Returning to the gas law demonstration in the previous report, there 4 of the most widely used parameters in science and engineering were referenced; pressure, volume, temperature, and an enumerated quantity moles. Two of these parameters, pressure and temperature, were seen to have many real world practical measurement scales such as; atmospheres or mm Hg, and °C or °F, which are used in a multitude of daily applications. Volume also has many common measurement units such as; liters, gallons, and bushels. For most applications in science and commerce though, the units of distance cubed for volume are simply used. In the gas law discussions a big deal was not made of whether the individual units specific to the parameters such as atmospheres and liters were used or whether the more basic units were used, such as mass/(distance x time^2) for pressure and distance cubed for volume. For applications of the gas law some measure of the parameters P, V, T, & n were all that was necessary. No concern was raised with how or even if these parameters referred back to the basic conceptual units of L distance-length, T duration-time , M mass, Q charge, Θ temperature, or N moles.

The absolute subatomic physics scales, offer a distinctly different and reverse situation. The basic conceptual units are always referenced, 4 in this case; L distance-length, T duration-time, M mass, Q charge. Under laid or behind these base units the measured parameters G, ε_o, μ_o, and e are found. As mentioned in Section 2.3, even more bizarre or comical is the fact that the absolute measurement units L, T, M, and Q do not in fact exist. Further, with the exception of Q referring to e, these basic units of measurement do not even refer to anything "real", but instead only refer to mental-conceptual mathematical constructs. Here there is a very clear distinction between the system bases and the measurement scales or units employed.

The question of relevance is, how does this distinction affect the work here. With the gas laws if 3 of the 4 system bases were employed, then the system under discussion was totally defined or properly constrained. Except there the system bases and measurement scales or parametric units were pretty much synonymous and were used interchangeably. Here using absolute scale systems diligent must be exercised to remember the distinction between the system bases G, ε_o, μ_o, and e and the measurement scales L, T, M, and Q. Here with the absolute physics scale systems there is NOT a one-to-one correspondence between the system bases and the measurement scales. Just by looking at the measurement units involved in an expression, there is no way to know if the system is under, properly, or over constrained. The number of system bases involves in the particular expression which is under consideration must be continually dug out from under the measurement units.

For those persons interested in combinatorics there is just about every mathematical combination possible between measurement units and system bases. Obviously if there is zero (0) system basis there is the result of zero (0) measurement units. As previously mentioned several times this case is not very interesting, nor useful, nor for that matter even a real physical possibly. On the other extreme there are a maximum in this work of the four (4) measurement units L, T, M, and Q. There can be combinations including the four (4) system bases simultaneously, at least on paper. Whether this can exist as a real world situation of truly independent parameters can be debated. In between though, there are just about every combination. One measurement unit being produced from or requiring 1 system basis to one measurement unit being produced from or requiring all four of the system bases. There are binary combinations of the system bases producing 2, 3, or all 4 of the dependent measurement units, and on-and-on.

Table 2 Absolute Systems of Scales – Measurement Units Versus System Bases

Selected Unit Combinations									
	Derived measurement unit combinations, exponents **Absolute Squigs Units**				Input force constant combinations, exponents				1 Absolute Unit Value in Common or Relative Units
	L	T	M	Q	G	ε_o	μ_o	e	
Gravitational Const	**3**	**-2**	**-1**		**1**				6.672590×10^{-11}
Electrical Constant	**-3**	**2**	**-1**	**2**		**1**			8.854188×10^{-12}
Magnetic Constant	**1**		**1**	**-2**			**1**		1.256637×10^{-06}
Elementary Charge				**1**				**1**	1.602177×10^{-19}
(ε_o, μ_o, e) G missing									
(mass·dist)(dist/time)	2	-1	1			-0.5	0.5	2	9.6706×10^{-36}
(G, μ_o, e) ε_o missing									
	2	-1			0.5		0.5	1	1.4671×10^{-27}
(G, ε_o, μ_o) e missing									
	-1		1		-1	-1	-1		$1.3469 \times 10^{+27}$
	-1			1	-0.5	-0.5	-1		$3.2739 \times 10^{+16}$
		-1		1	-0.5	-1	-1.5		$9.8149 \times 10^{+24}$
Force, produced by mass	1	-2	1		-1	-2	-2		$1.2106 \times 10^{+44}$
Power, Energy / Time	2	-3	1		-1	-2.5	-2.5		$3.6292 \times 10^{+52}$
Force, prod by charge	1	-2		1	-0.5	-2	-1.5		$2.9424 \times 10^{+33}$
Ternary Force Const	2	-2	-1	1	0.5	-0.5	-1		$2.1845 \times 10^{+06}$
(G, ε_o, e) μ_o missing									
Mass			1		-0.5	-0.5		1	6.5915×10^{-09}
Distance x Velocity^2	3	-2			0.5	-0.5		1	4.3982×10^{-19}
			1	1	-0.5	-0.5		2	1.0560×10^{-27}
			-2	1	1	1		-1	3.6875×10^{-03}
			-1	2	0.5	0.5		1	3.8943×10^{-30}
			-2	3	1	1		1	9.4657×10^{-41}
			-1	0.5	0.5	0.5		-0.5	6.0724×10^{-02}
			-1	1.5	0.5	0.5		0.5	9.7291×10^{-21}
			-2	2.5	1	1		0.5	2.3648×10^{-31}
			2	-1.5	-1	-1		0.5	$6.7750 \times 10^{+11}$
(μ_o, e) G & ε_o missing									
1st moment	1		1		0	0	1	2	3.2257×10^{-44}

Of particular interest here are the cases of properly constrained systems, or at least those that are called properly constrained, those involving 3 of the 4 system bases. At this point the lengthy discussions and/or proofs that any combination of 3 of the 4 bases of the absolute physics scales is sufficient, necessary, etc to properly constrain the the realm of discussion of the subatomic wave forms (particles) are left for other investigators and their books. Also in this work "properly constrained" is used as equating to measurement system independent. Again proofs of this are left to other investigators. In the work in Analyses of Measurement Systems II & III though the use of 3 of the 4 system bases is found to be or else to directly lead to the measurement system independence for the combinations of measurement parameters under discussion. Specifically this is true for those combinations used in the reports in Part1.

The discussion here is limited to those ternary combinations of G, ε_o, μ_o, and e which produce only 1 or 2 measurement units, and a few specific cases of particular importance where 3 measurement units are produced. Further the discussions are limited to cases where 3 of the 4 bases G, ε_o, μ_o, and e are raised to only various combinations of powers of -1, -0.5, +0.5, and +1. This gives a mere total of 128 cases to screen. That is without including reciprocals.

What is found is that there are no combinations of (ε_o, μ_o, e) G missing that produce a binary combination of the measurement units L, T, M, and Q, but (ML)(L/T) is listed as an important example of missing G. There is only 1 case with (G, μ_o, e) ε_o missing that meets the down select criteria. There are 2 cases with (G, ε_o, μ_o) e missing that meet the limited criteria and 5 other cases with no e of interest which are listed. Finally there are 8 cases with (G, ε_o, e) μ_o missing but many, 4, of these are not interesting because the measurement units are raised to fractional powers, multiples of 0.5. Of course if these fractional measurement unit combinations were viewed as being valuable, the combination of the system bases could be squared to remove these 1/2 powers. Also listed are important cases of this combination with μ_o missing which results in a single measurement parameter, mass, and one other case of interest mass x charge. These combinations of relevance are listed in Table 2 above.

As seen this table clearly illustrates the difference between the use of the absolute gas parameters and the absolute conceptual quantities of L, T, M, and Q. The use of any three of the gas parameters P, V, T, & n guarantees a well defined system. In Table 2 most of the useful combinations of the absolute physics system bases which lead to well defined systems are listed, but the corresponding measurement parameters vary from as little as 1 to as much as 4.

What is seen from this table is that there are a limited number of combinations of the measurement parameters which are useful in engineering and scientific work and that are at the same time what are being calling properly constrained. For example, velocity (L/T) is found to be measurement system dependent by its absence from this list of combinations of the three bases. The numerical value of the speed of light c, beloved by Planck and physicists ever since, is completely irrelevant and not useful for any work involving subatomic scale objects or energy wave forms. This was previously alluded to or mentioned in Section 3.3. Likewise the human way of ultimately defining Q as being $\propto (ML)^{0.5}$ is found to also be measurement system dependent, missing not seen in the table.

There are several quantities of immediate interest in Table 2; (ML)(L/T), (ε_o, μ_o, e) G missing, which was used in explaining the photon constant; mass per length, (G, ε_o, μ_o) e missing, which was used in scaling the masses of the leptons; and the Ternary Force Interaction constant, (G, ε_o, μ_o) e missing, which is the subject of analysis in the fourth report of Part 1. Sadly what is not found in this table is the quantities charge^2 / length, that is used to explain the charge of the leptons. If a person goes thru the algebra of the measurement units for this quantity charge^2 / length, then what is found is $Q^2 / L \propto e / ((G\,\varepsilon_o)^{0.5}\,\mu_o)$. Simply dividing e from both sides leaves $Q^1 / L \propto 1 / ((G\,\varepsilon_o)^{0.5}\,\mu_o)$, which is again an expression of only three of the four system bases.

As seen in the lepton report, the mathematical-geometric derivations or explanations for mass / length and charge^2 / length are utterly different from each other. Both of these quantities were the subjects of the entire lepton report and are only be briefly summarized here. Charge^2 / length is the result of a weird but precise mix of vector derivatives which calculate to be curvature κ and torsion τ for a specifically formulated cylindrical spiral (3 spatial dimensions). Specifying exactly what the underlying system bases for this quantity need to be to assure that this quantity is numerically measurement system independent is difficult at best. On the other hand, mass / length is the result of the product of several integrals of mathematical-geometric forms, which are also then multiplied by initial conditions. The discussion of how the various units which were assigned to these calculus forms could arise may be added to the appendices later as, Arisal of Measurement Units. An attempt at discussing such matters here is out of place. For the purposes here, the stage is only being set, showing some preliminaries of what might be expected or not expected when discussions are begun into just why the numerical constants used in the lepton and photon reports are in fact universal, measurement system independent. These analyses are the subject of Analyses of Measurement Systems I - III.

From the discussions here in Section 4 and throughout this entire report one of the fatal flaws with much of modern calculational physics for the last several decades is found; the attempt to excise G from existence. Without G there is not a sufficient or functional absolute measurement system with which to work. One of the 4 necessary foundations is missing. The model of the universe or the grid work that is being over laid over subatomic phenomena and particles is broken before even starting. Two examples of this of importance are already seen in Table 2. There the evaluations of the electron (mass/radial distance) and the elementary (charge^2/radial distance) both involve the "hated weakling" G. Academic physicists would have found these two constants used in lepton and photon reports at least 30 years ago, if they had been willing to let the subatomic universe be as it is. Instead they appeared to have tried to short change the universe, because of their own failings in the measurement of G.

Viewed positively, then many opportunities are opened to discover more universal, system independent, mathematical-geometric constants possibly applicable to particle physics when a decision is made that G has a right to exist. With the ability to raise the bases quantities of the 4 measurement scales to various powers even Edgar Buckingham would have trouble deciding how many constants, useful or otherwise, might be found. If nothing else, this short analysis of grid work measurement scales has opened a whole wealth of opportunities to the particle researcher.

As seen in this Section 4 there can be many combinations of numerical values and measurement units from a particular system of absolute physics units which are system independent. This is not the same as saying that these combinations are meaningful though. Care needs to be taken with the choice of words and with the uses of the absolute grid works of systems of scales. Meaning or purpose cannot be attributed where inherently there is none.

A final way to help in the construction of other "universal" constants is to remember what the task is of scientists in this particular realm. They are to be the translators from the world of particles to the world of humans. Parameters are the view of the world from the human perspective. Force constants are the view of the world from the particle perspective. Any translation or bridge between the two worlds needs sufficient information about the particle's view of reality to be of use or to help humans in any understanding of the reality of the world as the particles know it.

5 Underlying Bases

Before going on to make use of the absolute physics Squigs scales some further discussion is needed of several critical aspects of these and the Stoney and Planck systems of scales. In Table 1 above and in the three force constant laws (Newton's, Coulomb's, and the magnetic equivalent) the presentations appear so smooth and simple that many underlying assumptions are hidden and overlooked.

First there are 4 bases (G, ε_o, μ_o, and e) producing 4 measurement units or usable parameters (L, T, M, Q). Or is there? Repeating, there are what appears to be 4 interlinked but at the same time free standing scales, and further they are used as such. On closer examination though what is found is that while these absolute scales (Squigs, Stoney, and Planck) appear to stand on their own merit, there are some serious hidden difficulties with the relative or common SI scales which underlie them. These underlying SI scales which are used to set the numerical values and measurement units for the 4 bases (G, ε_o, μ_o, and e) for the absolute scales are not totally arbitrary nor independent. This discovery is critical to this work. This is also where there arises several ir-reconcilable disagreements or disputes with some highly touted authority figures in physics and the definitive reference texts written/edited by them.

Fair warning is given to persons who may cling strongly to the way the physics measurement bases have always been presented. Such persons could get highly perturbed by the discussions which follow in Section 5 and the two following Sections 6 and 7. To clarify, the purpose in these sections is not to knock what physics has done just for the sake of picking a fight. A critical and factual analysis of what has been presented in physics texts and references relating to this material needs to be made so that what is critical to the work here can be revealed. Such an analysis is essential to the work in Analyses of Measurement Systems I - III.

A way to begin is by referring The Physics Quick Reference Guide [1] published by the American Institute of Physics and edited by E. Richard Cohen. Starting in chapter 2, beginning on page 17 a series of either highly deceptive or else just flat out false statements are found. There is no way to cover this up or to say it politely. What is found there is a series of blatant false assertions. Further these falsehoods can cost subatomic research physicists years of their lives.

A direct quote from the first paragraph at the top of page 17 is, "The International System of units (systeme International d'Unites, with the international abbreviation SI), is the modern version of the metric system adopted by the Conference Generale des Poids et Mesures (General Conference of Weights and Measures, CGPM) in 1960. It is a coherent system with seven dimensionally independent base units." This last statement is flat out false.

The text goes on to describe the meter, kilogram, second, ampere, kelvin, mole, and candela as they have been defined by the CGPM. What is found are a series of very precise modern definitions. Only the first four are of any concern to this work. Technically, yes as the text defines the meter, kilogram, second, and ampere they "appear" to be independent. The problem though is that these precision modern definitions have changed nothing from the original underlying metric system. They just cover up the origins of the metric system and with E. R. Cohen's help misdirect scientists' attention away from what is needed to be known.

5.1 The Not So Independent Quantity Of Mass

Starting with an example best clarifies the contentions here. One of the first things that a youth was taught upon being introduced to the metric system in chemistry class in high school in the U.S. in the 1960's is that this system was originally conceived to make aqueous chemistry calculations simple. Specifically what are now the SI definitions for L and M were originally linked as follows

$$1 \text{ gram} = 1 \text{ ml} = 10^{-3} \text{ L or equally } 1\text{kg} = 1\text{L} \qquad (12)$$

likewise

$$1 \text{ gram} = 1 \text{ cm}^3 = (10^{-2} \text{ m})^3 \text{ or equally } 1 \text{ kg} = 10^{-3} \text{ m}^3 \qquad (13)$$

Of course these definitions linking mass and volume or distance^3 were stated in terms of the mass density of a specific substance, water. Over the years additional precision conditions of temperature, pressure, chemical purity, de-aeration, naturally occurring deuterium contents, etc were added. The verbiage is not of importance in comparison to the fact that the two scales for L and M were linked, both at base reference values of 1 unit mass = 1 cubic unit of distance or 1 linear distance unit^3. Of course this was exactly the original intention of the metric system's founders, to make the system of measurements and calculations involving aqueous chemistry simple.

The concern here is that the entire SI set of relative or common scales is built around this specific scale linkage. Any absolute scale system based upon these common scales also has this 1 numerical unit of mass : 1 numerical unit of length deeply embedded into it, out of sight, out of mind. A historical gratuity is that a √2 wasn't thrown in somewhere. This linkage of M to L is critical to the work in Analyses of Measurement Systems I - III and is easy to understand.

A person can argue that rather than a √2 being thrown in, there are 10^{-2}, 10^{-3}, and 10^{-6} multipliers ratioing the unit of mass to that of distance. Numerically yes, this is true. But the real crux of the matter is 1 gram was set equal 1 unit of distance^n conceptually. Whether these linked units are called milli-somethings, centi-somethings, or kilo-somethings, or any other names doesn't matter or undo the fact that they are linked

Likewise a person can argue that the unit of mass was de-linked from the unit of distance with the fabrication of the platinum iridium (Pt:Ir 90:10) prototype for the kilogram now in a vault in Sèvres France. The CGPM definition for the kilogram still references this prototype. While technically this definition does delink the kilogram from the unit of distance verbally and on paper, the net result is that nothing was changed. After all, this metallic mass standard is just a glorified bucket of water, albeit a very expensive and fancy one. Never-the-less this object is still just a container of mass which has been substituted equally, tit-for-tat, for the original bucket of water which occupied so much volume according to its density.

Likewise for all the other modern high powered redefinitions of the elementary base units of the metric system. They are very fancy and now precise to many decimals of accuracy, but they have changed nothing from the original intentions of the collection of units as a complete system. As examples when the definitions of the meter and second were given modern fancy definitions, these definitions were forced to effectively match the state of affairs which had previously existed.

This assertion that nothing has or was changed is clear to see. Upon the pouring of the two platinum iridium prototypes, one for length and one for mass, to be used as standards no French factory issued new standard metric rulers or new standard weights for balances. The notebooks of the chemists and other scientists of the previous century and other countries were not then red lined or corrected to indicate that the previous use of the centimeter or gram were invalid or needed to be modified.

A counter example to this supposed independence of the SI base units is easy to find. Consider the American Industrial units of mass, the pound, and length, the foot. Obviously these units clearly have nothing to do with each other. They are totally arbitrary, random, and independent. This unit of length references the length of a body part of some long forgotten king. The origins of this unit of mass are equally ludicrous.

5.2 The Not So Independent Quantity Of Charge

The other issue of dipute comes with the CGPM definition for the quantity of static or contained electrical charge, the coulomb. This comes about thru the definition for the flowing electrical quantity the ampere. The ampere is dependent, linked to, or derived from the other three sets of measurement units, as found in the following definitions. The following three definitions are found in the American Institute of Physics, The Physics Quick Reference Guide [1].

ampere: The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed 1 meter apart in vacuum, would produce between these conductors 2 x 10^{-7} newton per meter of length (From page 17).
coulomb: Quantity of electricity carried in one second by a current of 1 ampere. (From page 21).
newton: Force that gives to a mass of 1 kilogram an acceleration of 1 meter per second squared. (From page 21).

First, this definition of the ampere is about as clear as mud. Only an insider would know what is meant. The force which is referenced is not between the two conductors over their lengths. Rather what is meant is, the force experienced or seen by a (one) point on one of the conductors from the influence of the entire length of the other conductor. This is a hidden but critical mathematical-geometric conceptual point. This leads to a single integral, not to a point source style definition of the force laws, nor to a double integral if the length of both conductors was considered.

Next the constant current which is referenced should read "constant currents (plural) of one ampere each maintained in both of the two parallel conductors". Again this is crucial. Even though only the locality of one point on one of the conductors is being referenced, physicists intend to reference the current in both conductors. This gives a current squared, or charge squared, type appearance as seen with the point source style definitions of the force laws.

Putting the mathematical parts of these definitions together and deleting the verbiage and constraining phrases something approximating the following expressions are obtained.

$$\frac{F_m}{L_\parallel} = \left\{2k_m \int_{-\infty}^{+\infty} \frac{I_1 I_2}{L_\perp^2} dL_\parallel = 2\frac{\mu_0}{4\pi}\int_{-\infty}^{+\infty} \frac{I^2}{L_\perp^2} dL_\parallel = 2 \text{ x } 10^{-7}\frac{I^2}{L}\right\} = \{2 \text{ x } 10^{-7}\frac{\text{Newton}}{\text{meter of L}} = 2 \text{ x } 10^{-7}\frac{ML_\perp}{L_\parallel T^2}\} \quad (14)$$

Where F_m is a or the Force created by magnetism. See Equation (03)
k_m is the magnetic proportionality or scaling constant as seen in Equation (03)
I stands for an electrical current or amperes
μ_o is the universal free space magnetic constant chosen by humans in its inverted position from the universal free space electrical constant

What is found is that this definition is just an arbitrary means of linking the quantity of charge Q with the other already historically established conceptual quantities L, T, M. Further in a very un-physics like manner this definition which has been imposed upon physical reality makes no sense what-so-ever, neither in terms of mathematical numerics nor in terms of measurement units. Regardless, attempting to do the best that is possible with this situation the following manipulations can be made.
1 With the integrals on the left hand side of the "equation" the fact that the length parallel is a limit going to infinity is ignored, and likewise further the fact that this length even exists as a factor multiplying the current of amps, other than thru the integral.
2 For future reference, that the inverse square law, this needs to be remembered as being is a necessary part of this conceptual picture, but has been ignored for now in the left hand side of the "equation".
3 On both sides of the "equation" the fact that some of the lengths are parallel and some are perpendicular has been ignored, and the units of length are "canceled" whenever they occur in both the numerator and the denominator.

After applying the definition 1 coulomb = 1 ampere x 1 second, or rearranging 1 ampere = 1 coulomb \ 1 second, the result appears something like the following.

$$2 \text{ x } 10^{-7}\frac{Q^2}{LT^2} = 2 \text{ x } 10^{-7}\frac{M}{T^2} \quad \text{all in relative or common units} \quad (15)$$

This leads to the "definition"

$$1 \text{ coulomb, } Q = \{\frac{\text{Newton}}{\text{meter}}[\text{meter second}^2]\}^{1/2} = (ML)^{1/2} \text{ in relative or common units} \quad (16)$$

for the measurement unit and static quantity of concern.

To be fair, the actual mathematics, geometry, and calculus which are used with this definition look something like Figure 1.

In practice what is integrated here is Equation (17) below and the angle α from 0 to π/2. The results are seen in Table 3. Of course appropriate physical property multiplying constants are needed and obviously the integral needs to be stated in terms of appropriate generic or meta units.

$$\text{Total Magnetic Force} = \int_0^{\pi/2} \text{Force strength x Resultant position } d\alpha \qquad (17)$$

where; the force strength $\propto 2 / R^2$, for all angles of $\alpha > 0$
and; the resultant vector position = 2 $L_\perp$, for all angles of $\alpha > 0$

On integrating Equation (17) as illustrated in Figure 1 for various lengths of $L_\perp$ the results seen in Table 3 are obtained;

FIGURE 1

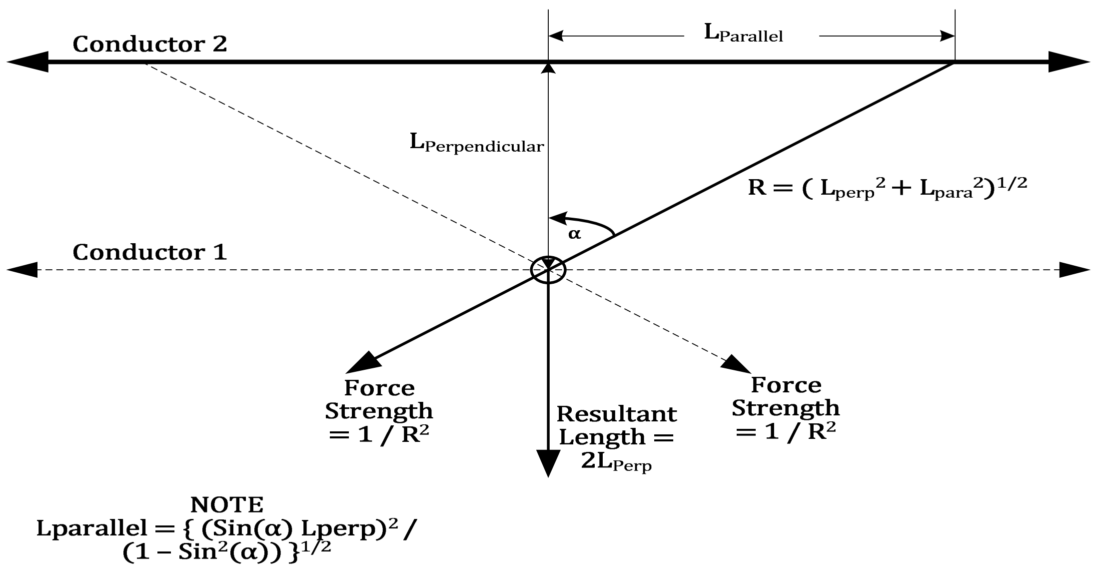


Table 3 Results Of Magnetic Force Integral

$L_\perp$	Total Force = $\int_0^{\pi/2} F(\alpha)d\alpha$	Force x $L_\perp$
0.25	12.5664	3.1416
0.50	6.2832	3.1416
1.00	3.1416	3.1416
2.00	1.5708	3.1416
4.00	0.7854	3.1416
8.00	0.3927	3.1416
16.00	0.1963	3.1416

As seen this human imposed definition results in the magnetic force behind the definition of the ampere and indirectly defining the coulomb is;

$$\text{Force x } L_\perp^1 = \text{Constant}$$

and Total Magnetic Force $\propto 1/L_{\perp}^{1}$

This is clearly not an inverse square law form. The integral just needs to be multiplied by some appropriate constants and the current squared to obtain the same appearance as the much simpler, but slightly technically incorrect, form as found in Equations (15) & (16) above. Again what is important here is the ultimate relationship tying the coulomb Q to the unit of length L as;

$$Q^2 \propto L^1 \text{ or } Q^1 \propto L^{1/2} \qquad (18)$$

Further not only are there the three definitions for the ampere, newton, and coulomb cross linking the numerical value and the units of the coulomb with the other already established quantities of L, T, and M, the entire hypothetical setup of the ampere further cross links the quantity of charge with M in a second way. This definition calls for a flowing quantity. The electron is a real "object" which has its own inherent mass and charge. Therefore for the stated quantity of charge which has moved in a specified period of time, ultimately to be called an ampere or coulomb, there is also a quantity of mass which has been moved. Unless the hypothetical setup is considered to be in space away from gravitational bodies or to be perfectly tangential with the earth's surface, then by moving this mass some work has been done. This is ignored in the definition.

What has been seen is that there is a distinction between the number of relative measurement system bases AS USED, and a possible number of real, reduced, or underlying bases.

5.3 Further Confusion Created By A Smoldering Turf War

These discussions of the gram $\propto cm^3$ and $Q^2 \propto L^1$ do not end the issues of concern. Continuing to read "The Physics Quick Reference Guide" from pages 24-30 other mysterious tidbits appear. What is found are more confusing and even flat out false statements. A direct quote from the first paragraph of Section 2.4.2 on page 27 is: "As a result, the ampere is an independent base unit, not simply a convenient name for the coherent unit for a derived quantity involving fractional powers of the mechanical base units." But as just shown in Equations (14) thru (16) and the integration of Figure 1 the ampere as defined on page 17 in this reference is exactly what it is claimed not to be on page 27.

Anyone can ask the obvious question, why? Why does a statement as this exist in such a definitive reference book? To cut to the ultimate purpose, what has been stumbled upon here are a series of underhanded slurs cast at the electrostatic (esu), electromagnetic (emu), and Gaussian (mixed) systems of measurements. Elsewhere, referring to these systems of measurements more disparaging remarks continue to appear. In the last paragraph of Section 2.4.1 at the top of page 27 these static systems are accused of being "irrational" or "non-rational". Here the implication is referring, not so subtly, to the mental fitness of the systems more than it is to their mathematical properties. Further there are more intentional slurs in the top paragraph of page 77 calling them "unrationalized" and purely mechanical. These statements are of course to imply that somehow the SI set of scales is better or superior because it is rational.

As just seen in Section 3.2 with the statement of Coulomb's Law and the magnetic equivalent, Equations (02) and (03), as these are now used by the SI set of scales there are overtly placed pi constants. Likewise in both the Stoney and Planck systems of absolute or "natural" units, seen in Table 1, there are necessary pi factors. The definition of a physical law or those definitions embedded in measurement systems that involve pi can hardly be said to meet the mathematical definition of being rational. Again, why are such blatant falsehoods implied? Why the need to imply that the SI scales are right and good and "those other" systems are wrong and bad?

Again there is a reminder that with all these pi constants inserted to "rationalize" the SI set of scales, humans are again attempting to impose their will, assumed realities, and geometries upon the inherent nature of the forces. Of course the forces and other subatomic phenomena did not necessarily vote upon or agree with these human macro size, political, and definitional fiats.

What is occurring here in this definitive reference book starting with Section 2.4.1on page 24 ending with Section 2.4.2 on page 28 is a low intensity turf war which has been going on for more than 100 years. Starting in 1960, after several decisive battles in this war, the victor brought to bear the power of General Conferences of Weights and Measures. Thru these conferences there has been a series of attempts to for-once-and-for-all kill off the static measurement systems. These have been last blatant and overt efforts to finally stomp out of existence the losing side of the major battles of this turf war.

Fortunately, there is no need to get involved in this nonsense. Adversarial science serves no-one, especially not the general public of the societies who paid for the work of these "deep thinkers". Competitive science is wonderful yes, but not this type of adversarial science. Unfortunately, such adversarial stances are still found to be continuing today in hypothetical physics. True scientists should have no use for and nothing to do with this type of "science" where the objective is not to find the facts and true nature about the universe, but rather where the objective is to kill the opponent, drive them out of existence.

A return to the immediate issue of concern, the coulomb, is all that is needed to find an obvious example of the destructive power of such intellectual turf wars, adversarial science. Any science student can ask, why the need for such a crazy convoluted dynamic definition of the ampere as just seen? Why make the definition of the coulomb into a secondary dependent subsidiary affair? Why not make a static quantity of charge like the coulomb the primary unit and the flowing or mathematical temporal derivative the subsidiary unit? Why not use Avogadro's Number and define the coulomb to be 1 mole of electrons or some multiple or fraction thereof? This would have been obvious, straight forwards, and simple to chemists. But no, this would have been a static definition and something chemists had proposed. The physicists had to do one up-men-ship and put their stamp of approval upon everything.

5.4 Reduction Of q_m Into A Dynamic Q, Maybe?

For the purpose here what is found in The Physics Quick Reference Guide and other definitive physics reference books is misdirected attention. A big deal is made of whether a system of units appears to have 3 or 4 base quantities. For this work this distinction is not what is at issue at all. What is at issue is the distinction between static and dynamic based systems.

For example what starts out appearing to be the simple statement of a force law, the magnetic one, in terms of the relative positions of static objects becomes something else totally different. On reviewing the equations for the magnetic force law and the magnetic constant, Equations (03 & 06), more embedded assumptions, hidden, out-of-sight, slight of hand manipulations are found.

Magnetic Force Law: $$\mathrm{Force}_m\,(\mathrm{M\,L/T^2}) = k_m \frac{q_{m1}q_{m2}}{r^2} = \frac{\mu_o}{4\pi}\frac{q_{m1}q_{m2}}{r^2} \qquad (03)$$

$$\mu_o = 4\,\pi\,F_m \frac{r^2}{q_{m1}q_{m2}} \quad \text{with measurement units } L^1T^0M^1Q^{-2} \qquad (06)$$

This constant μ_o has been given the numerical value $4\pi \times 10^{-7}$ and assigned the measurement units M^1L^1 / Q^2, where Q is the unit for the quantity of contained electrical charge. To accomplish this, simple algebra with the measurement units shows that q_m is defined as

$q_m = Q / (L/T)$ in relative or common units (19)

Again an immediately question; Why the dynamics? Why the need for velocity at all?

For the work here, this whole statement is bogus. The discussion here is about two pieces of lodestone (magnetic iron oxide, magnetite, Fe_3O_4) lying on a table. These are not charged objects. There is no motion, no B fields. The question is simply what is the strength and how is the force of attraction or repulsion measured between two pieces of lodestone, r distance apart?

Further, following thru with this "definition" and the typical substitution of the speed of light, c, for (L/T), as Planck and so many other physicists typically do, the result is.

$$q_m = Q / (L/T) = Q / c = Q\sqrt{\varepsilon_o \mu_o} \qquad (20)$$

From Equation (06) a self referential has been created.

$$\mu_o = 4\pi\, M \frac{L}{T^2} \frac{L^2}{Q_1\sqrt{\varepsilon_o \mu_o}\, Q_2\sqrt{\varepsilon_o \mu_o}} \qquad (21)$$

The definition of ε_o from Coulomb's Law, Equations (02) and (05) is

$$\varepsilon_o = 8.854,187,817 \times 10^{-12}\ Q^2/(M\ L) \times (T/L)^2$$

Even further and worse yet solving the "equation" (21) for μ_o, temporarily ignoring the numerics, the result is.

$$\mu_o \propto ML \left(\frac{L}{T}\right)^2 \frac{1}{Q^2} \qquad (22)$$

This obviously is not consistent with the measurement units $L^1T^0M^1Q^{-2}$ assigned to Equation (06) above.

There is a way to sum up all this business (confusion) involving μ_o, the magnetic force F_m and proportionality constant k_m, etc. seen in these last three sections 5.2, 5.3, 5.4. What is found is that historically once electrical current and motors came into their own, then magnetism became treated as the ugly step child of electricity. As seen there is no coulomb, C, counterpart for magnetism. There is no defined static quantity for magnetism, such as q_m used in Equation (06). That is, as least not in Mr. E. Richard Cohen's "The Physics Quick Reference Guide", if he at all can help it. The weaking lost out in favor of its big brother. It doesn't even have a name or measurement units to call its own. Actually it does, the Gauss. But again like everything in magnetics, the Gauss has been subrodinated as a combined measurement unit in which it is referenced to a flowing electrical current.

The scientists of Stoney's and Planck's time, as well as those ever since, seem to have forgotten that ancient mariners navigated for thousands of years with the use of lodestone compasses or pointing devices. Lodestone, Fe_3O_4 magnetic iron oxide, is a solid material (fixed, static, and uncharged) inherently having magnetism associated with it, just as the electron is an "object" which inherently has a charge associated with it. The scientists in the late 19th century were completely engrossed with their new play toy, electrical current, electro-magnetism. They were so enamored with turning magnetism into electricity and vice versa, thru the use of motion, that they appeared to have forgotten how to describe anything in static terms. In this work magnetism is not to be treated as if it were a mere step child which cannot exist without a big brother electrical current being around first.

6 Statics Versus Dynamics, And more Indeterminacies

What has been seen throughout Section 5 is that there has been a concerted effort, by the physicists, to stomp out of existence the static unit bases as first proposed by the chemists for the common measurement scales. Again the question, why this incessant need for velocity? From the viewpoint of mathematics, physics has this whole magnetic and electrical interconnection business out of order. The cart has been placed before the horse.

What is needed is to begin at the beginning, with static statements. If a specific function Y = F(t) is not known, then how can anyone expect to discuss momentum M x dY/dt, force M x d^2Y/dt^2, kinetic energy M x $(dY/dt)^2$, $(dY/dt)x(d^2Y/dt^2)$, etc?

For example in Part 1, in the lepton report, Sections 3 and 4.1 the starting concept is a vector statement of a point's position on a cylindrical spiral, as a function of the independent or implicit variable time.

$$\mathbf{R}(t) = a\cos[F(t)]\,\mathbf{i} + a\sin[F(t)]\mathbf{j} + bF(t)\mathbf{k} \qquad (23)$$

Then straight forwards steps are used to derive or calculate the 1st, 2nd, and 3rd derivatives. Then the definitions are introduced for curvature κ and torsion τ which involve these derivatives. Ultimately then a mathematical equation describing the quantity Q is produced.

Historically as discussed in this report though, this is not how the basic definitions of μ_o and ε_o have been treated. Physics for the reason of historical artifacts starts with electrical charge Q and a unit of magnetism q_m both already defined in terms of velocity or a 1st derivative. There isn't any grasp of the basic relation between a position or a static quantity and the magnetic force. Likewise as seen in Equations (14-16) there is never any attempt to get a grasp on the idea of a static quantity of electrical charge. This quantity the coulomb is immediately defined away, subordinated, in terms of a flowing current the ampere, as if that reveals anything about what this quantity is. For this work this quantity of contained electricity is exactly one of the objectives of investigation. What is this "thing" charge? How does it arise? The lepton report delves into this material in, Sections 3 and 4.1.

What is needed are some further basic definitions behind these relative SI scales since they are the bases of the absolute scales. If the following subscripts are assigned;

c for charge
m for magnetic
s for static
d for dynamic

then is found is that the meta quantity Q presently in use is understood to be Q_{cd}. This is not to be confused with quantum chromadynamics. Equally in the equations above q_m was actually Q_{md}. This does not apply so well to lodestone rocks sitting on a table.

There are and have been no static definitions. To get a proper or total grasp of the subject, basic physics phenomena, definitions are needed for Q_{cs}, Q_{cd}, Q_{ms}, Q_{md} and ε_s, ε_d, μ_s, μ_d in terms of time and space. For example, as found above with Equation (16), repeated here

$$1 \text{ coulomb, } Q_{cd} = (ML)^{1/2} \text{ in relative or common units} \qquad (16)$$

Now using Equation (19), $Q_{md} = Q_{cd}$ / (L/T), further reductions could be made, such as

$$Q_{md} = (M/L)^{1/2}T \text{ in relative or common units} \qquad (24)$$

Sadly most of these definitions do not or at least have not yet existed. In any case these distinctions between static definitions and dynamic definitions need to be remembered.

Returning again to the statements of Newton's Law, Coulomb's Law, and the magnetic equivalent in Equations (01) thru (03) completes this static versus dynamic discursive loop. On close examination of these laws further inconsistencies are revealed, besides those already listed back up in Section 3.1.

First Newton's Law is strictly a static affair. The force being described is defined thru the equation in terms of positions, no dynamics. If the derivative of this equation is made, then the force of concern or discussion, gravitational force, is found to be related to or would become potential energy.

Next Coulomb's Law appears to be the electrical charge analogue to Newton's Law. That is a static affair where the force of concern, due to charge, is again related to position and would be related to potential energy. Except as just seen by inverting this equation and solving for ε_o, repeating Equation (05)

$$\varepsilon_0 = \frac{1}{4\pi F_e}\frac{q_1 q_2}{r^2} \text{ which has the measurement units } L^{-3}T^{2}M^{-1}Q_{cd}^{2} \qquad (05)$$

then as is found ε_o is ultimately set equal to an expression which is derived in terms of a Q_{cd}. Behind the scenes out of sight Q_{cd} has been defined or subordinated in favor of a dynamic definition.

Then finally there is the supposedly analogous magnetic law. Initially yes, this equation as posed in terms of q_m's is again what appears to be a static or potential style equation dependent of positions. But on coming to any application of this equation, which is absolutely necessary to get anywhere, what is found in Equation (19), repeated here

$$Q_{md} = Q_{cd} / (L/T) \text{ in relative or common units} \qquad (19)$$

is this law slides into a dynamic definition. The force of concern or discussion, due to magnetism, has been twisted into being related to kinetic energy. Double so in that Q_{md} has been defined in terms of Q_{cd}, itself a dynamic affair. Then further this Q_{cd} has had the blatant (L/T) velocity applied to it. For the nice appearing one, two, three statements of the force laws with their embedded force constants even more inconsistencies are found. In two of the laws, the force is or would be related to potential energy and in the last the force is or would be related to kinetic energy.

7 Summarizing The Discussions Of The Common Measurement System's Underlying Basis

To summarize what what has been found in both Sections 5 and 6, is that science is not at all what students are lead to believe when they approached it as youths. This is, at least not specifically in the case of physics and the underlying bases for its entire relative measurement system. Students are lead to believe that science begins with certain irrefutable definitions or statements, such as 1 + 1 = 2. A particular branch of science then builds a solid foundation from a set of such statements. From here it moves on using deductive logic and mathematics to build an unshakable structure of whatever the particular subject matter happens to be. What has been found in this case is that in definitive physics reference texts are false statements, misdirected attention, self contradictory definitions, hopelessly tangled statics and dynamics, and a multitude of other highly unscientific beginnings upon which the structure of a subject matter has been built.

One final example is offered to again further clarify the contention here. Again page 17 of The Physics Quick Reference Guide is referenced. There the generic L, the meter, is defined away in terms of time T. Directly quoting, "The meter is the length of the path traveled by light in vacuum during a time of 1/299,792,458 of a second. [17th CGPM (1983), Resolution 1.]" Modern physics has defined the unit of L in terms of the speed of light, c. But the speed of light is declared by fiat to be 2.99,792,458 x 10^8 m/s. The following circular or self referential definition results.

1 meter length = speed x time = (2.99,792,458 x 10^8) m/s x (1/299,792,458) second (25)

This "definition" of the meter is an utterly self referential tautology. This cannot be programed for any algebraic purposes, nor would it be permitted as a definition in any dictionary.

Additionally c is already defined in terms of ε_o and μ_o, and ε_o and μ_o are defined in terms of c and variously each other. What a mess this is. So despite the valiant verbiage on page 17 of this reference, there is not a solid coherent foundation upon which to stand to do work in this realm of science, specifically sub-sub atomic physics.

Finally returning to The Physics Quick Reference Guide Sections 2.4.1 and 2.4.2. and its bad mouthing of systems of units with 3 bases. The systems which are given severe put-downs are the electrostatic (esu), electromagnetic (emu), and Gaussian (mixed) systems of measurements. These put-downs are of course in comparison to the SI set of units which supposedly has 4 bases. That is, at least the 4 measurement scales L, T, M, and Q_{cd} of concern in this work.

What has been exposed, though, is that the modern SI set of units is in fact what started out as a 5 bases system; L, T, M, Q_{cd}, and Q_{md}. This was forcefully reduced to 4 bases thru the unspoken Equation (19) which defines Q_{md} dynamically in terms of Q_{cd}. This is further reduced to 3 bases by defining Q_{cd} in terms of M, L as in Equations (14-16) and Figure 1. Again this is a dynamic definition. But then the elimination of this parameter is never used. Finally as just seen the static meter was defined away in terms of the dynamic velocity of light, c, sort of. Yet another dynamic definition and again this reduction of a parameter is never used. And ultimately before all these various reductions to dynamics, the unit of M was found to be linked to the unit of L^3 from the very get go.

Who is counting any more? Lawyers would have great fun with the questions; the SI set of units has how many bases? How many bases as used, and how many of these are is fact independent? How many true underlying bases are there, and how many of these are independent? And on and on.

What has been shown in this report is that when the supposedly four independent scales for L, T, M, and Q_{cd} are examined they are in fact found to be an irrevocably tangled mess of highly self referential definitions, and not a set of independent base units what-so-ever. Further this tangle is so knotted that even Edgar Buckingham could not determine if this supposedly independent set of units over, properly, or under constrains physical reality and the subatomic particles that are being investigated.

Ultimately the highly touted SI set of units is found to be just an arbitrary hodge podge and not at all something rational or sacred as it is make out to be. But whatever it may or may not be, the current modern SI set of units is build around and has dynamics deeply embedded into it. And for the purposes of the work here these hidden dynamics are carried forwards into the absolute systems of units.

Finally why things have been done as they have been with respect to the basic measurement parameters of physics is understood. The course of actions taken and definitions so developed were for logical, proper, and good reasons. Never-the-less, before delving into the systems analysis of uses the absolute physics Squigs measurement system, pointing out several of the consequences of the underlying structure of the SI system of relative units has been necessary.

8 The Affects Of The Underlying Common Systems Basis Upon The Absolute Systems

8.1 The Effects Of Dynamically Defined Relative Scales

So the end of this investigation of the bases underlying the absolute physics scale systems has been reached. At this point a fair question is why all the emphasis on statics versus dynamics? So what if the SI set of measurement scales has dynamics deeply ingrained into it, who cares?

There are several reasons to care. Physics measurement systems, both relative and especially an absolute one, would be preferred that correctly reflect properties and phenomena of the "natural" world that they are set up to model. If a proposed "natural" or absolute measurement system does not in fact correctly represent its realm of discussion, even though it may reflect proper size and duration for that realm, then does such a measurement system meet the definition of being absolute? Absolute measurement systems should avoid Terran human mental conceptual stories, **assumed** geometries, linkages to behind the scenes mathematical-calculus outcomes, etc. Dynamics introduces all of these undesirable features.

First as already pointed out, the speed of light, c, beloved by Planck and all other physicists since has a worthless numerical value. This constant only involves two of the four measurement system bases, ε_o and μ_o, and therefore its numerical value is measurement system dependent.

Secondly and more importantly, dynamics involves a path and an assumed geometry for the statement of what is occurring. For example; the definition of the ampere was stated in terms of two parallel conductors. This geometric definition turned a well established relationship Force $\propto 1/L^2$ into a relationship of Force $\propto 1/L^1$.

What if the definition had been posed with the point experiencing the force on a first conductor placed between two other parallel conductors at equal distance on either side of it in a plane? Following thru with this definitional setup in an analogous manner to the definition used would have resulted in a current or charge cubed relationship with distance. The relationship in

Equation (18) $Q^2 \propto L^1$ or $Q^1 \propto L^{1/2}$ would have become $Q^3 \propto L^1$ or $Q^1 \propto L^{1/3}$.

Besides planar geometry, the definition could have been posed with the point of interest surrounded by a cylinder of current or a spherical surface. There are any number of geometries which upon integrating, especially those which would require double or triple integrals, would have turned the inverse square law into a logarithmic relationship or even a first power (non-inverse) relationship with distance.

As soon as dynamics are invoked, or time, the model moves away from point source definitions to those involving **assumed** 2, 3, or n dimensional geometries and the mathematics and calculus to go with them. While the calculus and analytical geometry if done correctly may be perfectly valid, its results may completely obscure the original static inverse square law force relationships of nature. In short human thought experiments and definitional geometries, other than those of point sources, easily can and have lead to measurement scales and systems out of sync with nature.

8.2 The Effects Of Linked Relative Scales

The other big problem with Terran human introduced geometry was the original linking of mass with distance, in a cubic manner. While this was perfectly logical and met the simplistic objectives of the metric system's creators, this linkage does pose some severe difficulties for applications in the world realm of absolute physics. For example, had humans lived in a flat world then the scale for mass logically would have been linked to that of distance in a one-to-one second power manner.

What if the neutrinos only consist of a linear mass structure which incidentally tumbles around in n-dimensional space? As found in the lepton and photon reports these two species of elementary electromagnetic wave forms only have two dimensional mass or energy structures which move into the third dimension with time. These "particles" were found to have primary radial (one dimensional) mass, or energy, structures which have an exponential decay with distance. These are then multiplied by some angular mass, or energy, distributions. In all likelihood the quarks and gluons have similar mass structures which are further multiplied by a second angular mass distribution. None of these real world particle geometries of nature fit very well with the human imposed scales that tie mass on a one-to-one basis with a distance scale cubed. All that is needed for this work, since the electromagnetic wave forms (particles) only have a primary radial one dimensional mass density relationship, which is just scaled by some angular distributions, is a one-to-one first power relationship between mass and distance for the underlying measurement scales of concern.

The seriousness this issue of humans having defined mass as a phenomenon having three spatial dimensions is further made obvious by the discussions in Part 2, Report 2.2, Towards a Periodic Table of the Elements of Physics, Section 3.1, Spatial-Geometric Reasoning. There strong reasoning was given for the case that in fact the neutrinos have only one spatial dimension and that the quarks have four. The question and concerns raised in the last paragraph are probably more than just hypothetical. Additionally in Part 2, Report 2.2, Towards a Periodic Table of the Elements of Physics, Section 6.1, The N-Spheres the issue of humans habitually viewing mass as an interior phenomenon is briefly raised. Regardless of the shape, form, or number of spatial dimensions of an "object", body, or energy form humans have viewed the interior as related to mass and the surface or exterior as related to charge. Again, neither of these viewpoint habits of humans are compatible with humans making up arbitrary definitions for-once-and-for-all for the quantities of mass and charge and imposing them upon the particles, without even first knowing how many spatial dimensions the various particle forms have or occupy.

Further the issue that the simplistic human macro or relative scales for mass and charge are linear in nature has not even been addressed. That is to say they have uniform density throughout. Likewise for the absolute scales. How does this linear overlay fit with nature which frequently has quadratic or inverse quadratic radial behaviors? For example the basic forces have inverse square law behaviors. Mathematically should and how should linear absolute scales be overlaid upon them? Also as just mentioned, the lepton mass structures have exponential radial behaviors.

Ultimately the SI metric set of units was found not to have 4 independent scale bases. The two quantities "understood" or experienced by humans, distance-length and duration-time do have completely arbitrary bases. Be that as it may. What causes severe difficulty in the efforts here to describe the particles or wave forms are the <u>human definitional geometric stories which have been imposed upon the two parameters, mass and charge.</u> These properties are what are experienced or sensed by the particles or wave forms. First, these definitions effectively link these two parameters M and Q as dependent variables of L and T. They are not independent bases. Secondly, the particles and other subatomic wave forms were not consulted to determine if they agreed with the human macro world geometric stories. From the view of subatomic researchers, humans have attempted to impose their will or their geometric concepts of mass and charge upon wave forms which have lives of their own.

These issues arise in Analyses of Measurement Systems I. The preferred course of science would have been if the relative measurement systems upon which the absolute physics scales were based had stayed with giving descriptions of nature, such as of the forces. Had humans just stayed with describing the forces and their bases in terms of inverse square law (static point source) relationships or other such phenomenological features of nature, this then would have been the better choice for subatomic scale research and the the absolute scales.

9 Inverse Square Law Concerns

There is one final consideration in this report concerning the absolute scale systems. Although last, this issue is still of great importance. This is the topic of the inverse square law and how it applies to the bases underlying the absolute scale systems. As is seen in Analyses of Measurement Systems I, the necessary inverse square law consideration, with units of L^{-2}, cannot be ignored when discussing the measurement systems of other intelligent beings. Unfortunately again, some further indeterminacies are found here.

Repeating the definitions of the three universal force laws.

Newton's Law $$F_g = G\,\frac{m_1 m_2}{r^2} \qquad (01)$$

Coulomb's Law $F_e = k_e \frac{q_1 q_2}{r^2} = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$ (02)

Magnetic Equivalent $F_m = k_m \frac{q_{m1} q_{m2}}{r^2} = \frac{\mu_0}{4\pi} \frac{q_{m1} q_{m2}}{r^2}$ (03)

Starting with Newton's Law, obviously the force F is inversely proportional with the distance between the two objects of concern. Likewise for Coulomb's Law and the Magnetic Equivalent. The question is, if the measurement system for r is changed, how do G and the other force constants change numerically?

Using the inverted equations as definitions for the force constants the following were found.

$G = F_g \frac{r^2}{m_1 m_2}$ which has the units of $L^3T^{-2}M^{-1}Q^0$ (04)

$\varepsilon_0 = \frac{1}{4\pi F_e} \frac{q_1 q_2}{r^2}$ which has the units $L^{-3}T^2M^{-1}Q^2$ (05)

$\mu_0 = 4\,\pi\, F_m \frac{r^2}{q_{m1} q_{m2}}$ which has the units $L^1T^0M^1Q^{-2}$ (06)

Where in all three expressions the forces, F_g, F_e, F_m have the mechanical units of $(M\,L/T^2)$ and μ_o ends up with units involving Q thru the Equation (19) $q_{md} = Q_{cd} / (L/T)$ previously discussed.

Just the straight forwards unit conversions for L should suffice. But do they? While the distance between the objects of concern is being held constant, its sizing is being changed by the ratio of L in the measurement systems of concern. How does the L embedded in the force $F = (M\ L/T^2)$ in the original left hand side of the Equations (01-03) respond to this resized inverse square behavior on the other side of the equation? How do the "universal" force constants respond to this? This point is not argued here. Just straight unit conversions are assumed to suffice.

Is this all? The answer is NO. The last two equations (05) and (06) also involve Q. As discussed in Section 5.2 the definition of Q^2 has an ignored 1 unit length inverse first power law component. This is after being integrated for a length as seen with the integration of Figure 1. So Q is defined as not just a point source quantity as is assumed in the setup of Equation (02). Transporting this $\frac{1}{L_\perp^1=1}$ to the other side of any of the Equations (02-03, 05-06, or 14-16), that is away from the ampere or equally away from the coulomb, the following results;

$Q^2 \propto L^1$ and ultimately if the size of L is changed, $\varepsilon_o \propto L^{-2}$

$Q^{-2} \propto 1/L^1$ and ultimately if the size of L is changed, $\mu_o \propto L^0$

Does this answer the question? At first thought someone would guess that the mathematically correct way to state the interacting effects of the inverse square law behavior and those of changing measurement systems on the quantities ε_o and μ_o could be easily checked by simply reviewing the billions of experiments done here on earth. This is not possible though. The use of the electromagnetic forces is so recent in the history of human events there is only one word and one quantity for contained charge which has been defined, the coulomb. Even the oddball American Industrial system of units uses the coulomb. What happens when measurement systems are encountered of other intelligent beings who do not use a human style parallel wire dynamic definition for their quantity of contained electrical charge? This question deserves some serious consideration. Further an answer is needed before going on to Analyses of Measurement Systems I which sets up a parallel absolute physics measurement system for another intelligent species.

10 References

[1] E.R. Cohen, The physics quick reference guide, AIP Press, 1996, p.17-21

CHAPTER 3.4 ANALYSES OF MEASUREMENT SYSTEMS I

1 Introduction

1.1 Abstract

This report develops two systems of absolute physics subatomic measurement scales. These scales apply to the size and duration realm of the basic electromagnetic waveforms (particles), the leptons and photons alike. With these scales the verification of three elementary physics constants is begun. These constants were first developed in the lepton and photon reports from mathematical-geometrical considerations. The verification here is from an approach which is completely independent from the mathematical-geometric developments used earlier. The analysis of measurement systems is used here. This is done in a in a side-by-side manner for each of the two absolute scale systems that have been laid out. These mathematical-geometric constants which are not unitless can be stated as having conceptual meta units. Because these constants have general parametric units associated with them, their numerical values are measurement system independent. A journey is started to demonstrate how these particular constants are universal and in the case of one constant this journey is finished. The completion of this objective for the other two constants of concern needs to be held over until Analyses of Measurement Systems III.

1.2 Objective & Scope

The general objective of this report is to construct two systems of interlocked, self consistent, and comprehensive absolute physics scales which apply at the subatomic scale of events and waveforms. Procedures are demonstrated for using these systems of scales, how to import data into them, and how to "equilibrate" data in them. What starting data is valid for use with these scales and procedures are discussed. Many other aspects of using these scales are high lighted, particularly several underlying inherent features and assumptions. From these assumptions limitations are seen upon what can be done mathematically and where errors are made when attempting to make use of these absolute scale systems.

The necessity of using absolute scales in this work is emphasized or when dealing with scientific phenomena in whatever the size realm in which they are found. This is as opposed to the use of the familiar relative or common scales. In Report 3.1, Measurement Units & Scales absolute scales are defined and discussed, their nature, scope, and distinction from relative scales. Here the correct application of several specific absolute physics scales to their appropriate realm of discussion is shown to trump their arbitrary nature and historical origins. The necessity of using all the underlying references or required bases of a system of scales are also emphasized. This report clearly show that one of the inherent and necessary basis of a scale system cannot be neglected or discarded because it is viewed as a weakling, is de facto poorly measured, or is otherwise undesirable.

Specifically, demonstrations are started for how the values of the three key mathematical-geometric constants found in the lepton and photon reports can be used with any system of absolute physics scales. These constants are;

photon (mass·distance)(distance/time), 68,517,994,75 (ML)(L/T) absolute
electron mass^1 / radial distance, 1.861432 x 10^{+05}(M relative/L absolute)
electron charge^2 / radial distance, 5.245406 x 10^{-03} (Q^2 relative/L absolute)

Stated slightly differently;
1 The quantity $1/(2\alpha)$ with absolute units $(m_{Sgs}l_{Sgs})(l_{Sgs}/t_{Sgs})$, as the mathematical-geometric under pinning of the photon, Planck, constant of (ML)(L/T) with its relative measurement units, (kgm)(m/s).
2 The mass of the electron m_e, mass^1 per radial distance with mixed relative per absolute units, kg/l_{Sgs}.

3 The charge of the electron e^2, charge squared per radial distance with mixed relative per absolute units, C^2/l_{Sgs}.

This report finishes with the reminder that one of the scale systems used here originated with completely arbitrary human inventions and the other was constructed on-the-spot based upon random numbers. The conclusion can be made that the numerical values of these three constants are indeed numerically universal and measurement system independent as verified here or finished in Analyses of Measurement Systems III for two of these constants.

2 Particle Physics Parameters And Systems

In Report 3.2, Absolute Measurement Systems – Example Of Usage, a detailed side-by-side example of working with two scaling systems was given. These particular systems related to the application of the gas law of chemistry. In Report 3.3, Measurement Systems Bases, the absolute system of units were established that would be used here for the investigation of the subatomic physics wave forms (particles), specifically the leptons and photons. In this report the materials established in these two discussions are blended together and applied to verifying several mathematical-geometric constants needed for this overall work. The same beginning is made here as done with the gas law demonstration. Where applicable an analogous series of steps are followed, except this time the procedure is applied to two absolute physics scale systems, instead of absolute chemistry scale systems as before.

Step 1: First two systems of units need to be chosen for discussion for the topic of subatomic physics waveforms (particles). Just as before within the discussion of the gas law scale, systems are wanted that are totally arbitrary but never-the-less where both have the same absolute scope. For the purpose of the discussions here an emphasis is placed on the the arbitrariness of both frameworks.

Beginning, imagine that in the course of history since the most recent Big Bang that there arose a species of intelligent beings who developed a high level of civilization. These matriarchal Samanthan Felines discovered inter-dimensional space travel and spread out amongst the galaxies for about 100 million years before slowly dwindling and disappearing. About one billion years later there arose another civilization of low level this time. These fur-less and tail-less patriarchal Terran Humanoids had a cosmologically ever-so-brief existence and never developed interstellar travel.

A stipulation is needed that both species measured and quantified the same phenomena, the physical universe as humans understand it to be. This is one of the few required criteria or assumptions. Further the Samanthan and Terran systems of science and engineering must be analogous. Otherwise there cannot be a discussion. Having some relationship between the systems is necessary. That is, the two systems while they must be completely independent, at the same time they cannot be completely disconnected. Otherwise the task here is a fool's mission. The generality or universality of the constants developed for one system of measurement cannot be shown by attempting to refer to another system which has no relationship what-so-ever.

Specifically for this work the two following systems of units or scales are used.

First there is the Samanthan set of relative scales. These are called the Samanthan Feline System. This has the 4 primary units of;

distance-length,	tails (t)
duration-time,	naps (n)
mass,	pudg-os (p)
charge,	blivets (b)

The minor units do not need to be discussed here but the Samanthan's distance units were based on base 16 (4 fingers x 4 paws), instead of the human base 10. Likewise obviously their units of time were based upon powers of 9 (lives), instead of the human base 60. Note, there were also historical artifacts in the Samanthan Feline system in that a "blivet" could either be a small (1/16th) "bliv", or a large (size16) "vet".

For the Terran or Human set of relative scales the SI scales are used with the 4 primary units of;

distance-length, meters (m)
duration-time, seconds (s)
mass, kilograms (kg)
charge, coulombs (C)

The static unit of contained charge is used in this work, not the flowing unit of amperes.

Next the Samanthan absolute physics scales are needed. These are the Samanthan Purrfect Units, as defined and discussed in the next several steps.

Finally the Terran or Human absolute physics scales are needed. These are Squigs Units as defined and discussed in Report 3.3 Measurement System Bases. Although this next step is slightly out of order compared to the gas law example, the definitions of these Squigs Units are repeated here to get them out of the way.

Absolute distance = Squigs distance, $l_{Sgs} = G^{0.5}\ \varepsilon_o^{0.5}\ \mu_o^{1}\ e^{1} = 4.893{,}753 \times 10^{-36}$ relative meters
Absolute time = Squigs time, $t_{Sgs} = G^{0.5}\ \varepsilon_o^{1}\ \mu_o^{1.5}\ e^{1} = 1.632{,}380 \times 10^{-44}$ relative seconds
Absolute mass = Squigs mass, $m_{Sgs} = G^{-0.5}\ \varepsilon_o^{-0.5}\ \mu_o^{0}\ e^{1} = 6.591{,}572 \times 10^{-09}$ relative kilograms
Absolute charge = Squigs charge, $c_{Sgs} = G^{0}\ \varepsilon_o^{0}\ \mu_o^{0}\ e^{1} = 1.602{,}177 \times 10^{-19}$ relative Coulombs

Frequently semantic or verbal distinctions are used to emphasize the nature or scope of the units being discussed. There are the common units in which all data and scientific quantities have in fact been measured. These can also be called measurement units, local, normal, observation, regular, or relative units. Additionally there are the absolute units which reveal something about the underlying structure, framework, or reference basis of the subatomic realm of discussion. The reader is referred back to the discussions of the concepts of relative and absolute in Report 3.1, Measurement Units & Scales.

If possible in all the discussions and examples in this report, all unit conversions, input data, calculations, etc begin with the Samanthan Feline systems of units. Obviously for the measurements of the universal force constants, particle properties, and other such data, starting with these numerical values as found in the Terran Human systems of units is necessary.

Finally for simplicity all numerical quantities in this and Analyses of Measurement Systems II & III are expressed in the human base 10 counting system, even though the Samanthans counted in base 16.

Step 2.1: As before with the gas law example (Report 3.2, Absolute Measurement Systems – Example Of Usage), the required parameters of the topic need to be specified and a means to convert the measurements or map values between the two systems is needed. The required parameters are four;

distance-length, L
duration-time, T
mass, M
charge, Q

As just seen above the relative versions of these primary variables, or meta units they could be called, are listed with their names in each system. Also seen is one of the absolute versions of these parameters or meta units, the Terran Squigs Units.

The variables here are simple parameters with one measurement unit. These variables do not require the dissection, analysis, and explanations which were needed with temperature, pressure, etc. with the parameters in the gas law demonstration. To avoid any confusion the specification is made, that throughout this report and the rest of this work unless specified otherwise the words "distance" and "length" are used somewhat synonymously, unless a specific mathematical expression is being referenced, such as the distance equation.

Now comes the fun part. To emphasize the complete lack of any preplanned connection between the two systems, **small size random numbers are used for the conversion constants between the Samanthan and Terran relative measurement scales for the 3 units of L, T, and M.** For the fourth scale, Q the quantity of electrical charge, the specification is made that the Samanthans defined their scale such that numerically $Q^2_{electron} \sim M_{electron}$ or $Q_{electron} \sim \sqrt{M_{electron}}$. For this quantity the interspecies conversion falls where it may.

The long form precise routines to convert numerical values between general linear scales were detailed in Report 3.1, Measurement Units & Scales. Here the Samanthan relative scales are specified as having been linear, zero based, etc and had all the other niceties that are needed to just directly go to simplistic conversion routines. The interspecies relative unit conversions have the form $Y = bX^1$. Specifically;

L distance-length;	1 Samanthan tail (t)	= 2.864302 Terran SI meters (m)
T duration-time;	1 Samanthan nap (n)	= 1.126596 Terran SI seconds (s)
M mass;	1 Samanthan pudg-o (p)	= 1.271704 Terran SI kilograms (kg)
Q charge;	1 Samanthan blivet (b)	= 1.890,367 x 10^{-4} Terran SI coulombs (C)

Using these conversions for the four parameters distance, time, mass, and charge all the combinations of units typically found in scientific and engineering calculations can be created and listed in Table 1.2.

Here the preparations could get more complicated, if artifacts of the human system of scales are allowed to derail logical thinking. In the Terran human system the fourth scale of units, for a static or encapsulated quantity of electromagnetism, the coulomb, was defined in terms of the original three scales of measurement; distance, time, and the first property related to particles, mass. Calculating what value the Samanthan Feline unit of electromagnetism, the blivet, would be expected to have if it were to be completely analogous to the Terran Human coulomb might appear desirable or even necessary. The results of this calculation are embedded in Table 2.1 and also listed in Table 1.1. Then what excess or deficient scale size the Samanthans gave their unit for the quantity of contained charge could be seen, as also listed in Table 1.1. This information and procedure are not necessary though. All that needs to be known is the random value which translates from their charge scale to the Terran charge scale. Ultimately the only function that either of these unit sizes for contained charge does is to scale the size of the elementary charge of the leptons.

Step 2.2: In the gas law demonstration after defining the systems of concern, the nature of their variables, and the scales against which those variables are measured, then great effort was exerted to show how to rigorously convert values between the different forms or presentations of the variables. Conversion of values between the two relative systems was rigorously demonstrated and also how to go from relative to absolute values within each system where necessary. Then the data was introduced.

This order of operations could be done because the systems which were being used already existed. Here the situation is different. Neither of the absolute frameworks needed for this work currently existed. The Terran or human absolute physics Squigs scales were introduced in Report 3.3, Measurement Systems Bases and its key unit conversions were repeated in Step 1 above. These conversions were made from the relative or common metric measurement system to the absolute physics measurement system to tie the new scales and concepts to something that was already familiar. Here a key step had already been passed through unnoticed. This was the gathering of the data which is necessary to construct the absolute physics scales of humans.

Table 1 Systems Of Scales – Comparisons And Conversions Of Relative Measures

Table 1.1 Necessary Unit Conversions					
Independent or Arbitrary Scales	Universal or Generic Notation	Samanthan Feline System	1 Sam Unit = X Terran SI Units	Reciprocals	Terran Human SI Unit Set
Distance, Length	L	tail, t	**2.864,302**	0.349,125	meter, m
Duration, Time	T	nap, n	**1.126,596**	0.887,630	second, s
Dependent Defined Terran Scales					
Property 1, Mass	M	pudg-o, p	**1.271,704**	0.786,346	kilogram kg
Property 2, Charge	Q	blivet, b	**$1.890,367 \times 10^{-04}$**	$5.282,519 \times 10^{+03}$	coulomb C
Predicted ratio from human system			15.658,144	0.063,864,5	
Deficient Samanthan scaling factor			$1.208,978 \times 10^{-05}$	$8.271,442 \times 10^{+04}$	
Property 3, Color	K	calico, c	Not Avail		white, w
Table 1.2 Other Derived Relative Conversions Of Interest					
Velocity, 1st derivative	L/T		2.542,441	0.393,323	
Acceleration, 2nd deriv	L/T^2		2.256,747	0.443,116	
Jerk, 3rd derivative	L/T^3		2.003,158	0.499,211	
Jounce, 4th derivative	L/T^4		1.778,064	0.562,409	
Velocity^2	$(L/T)^2$		6.464,005	0.154,703	
Velocity^3	$(L/T)^3$		16.434,366	0.060,848	
1st moment	ML		2.642,544	0.274,555	
2nd moment	ML^2		10.433,346	0.009,584	
Momentum	$M(L/T)$		3.233,233	0.309,288	
Force	$(M/T)(L/T)$	pounce	2.869,915	0.348,442	newton
Force / Dist	M/T^2		1.001,959	0.998,044	
Force / Dist^2 (Pressure)	$M/(LT^2)$		0.349,809	2.858,701	
Viscosity	$M/(LT)$		0.394,093	2.537468	
Energy x Time	$(ML)(L/T)$		9.260,958	0.107,980	
Energy (Work, Heat, PV)	$M(L/T)^2$	jump	8.220,304	0.121,650	joule
Power (Energy / Time)	$(M/T)(L/T)^2$	spring	7.296,588	0.137,050	watt
Human Def'n of Charge	$Q = (LM)^{1/2}$		1.908,545	0.523,959	
Spatial Density, Mass					
Linear	M/L^1		0.443,984	2.252,333	
Area	M/L^2		0.155,006	6.451,364	
Volumetric	M/L^3		0.054,116	18.478,658	
Spatial Density,Charge					
Linear	Q/L^1		$6.609,067 \times 10^{-05}$	$1.513,073 \times 10^{+04}$	
Area	Q/L^2		$2.307,392 \times 10^{-05}$	$4.333,898 \times 10^{+04}$	
Volumetric	Q/L^3		$8.055,684 \times 10^{-06}$	$1.241,360 \times 10^{+05}$	
Notes: Key boxed conversion values are random numbers					

As just specified above, the choice of absolute physics scales is based upon the three universal force constants G, ε_o, and μ_o, for gravity, electricity, and magnetism and additionally upon the elementary charge e. The values of these data, as measured in the relative SI units, were listed in the introductory pages to Part 3, Table 1, and are repeated here in Table 2. Once measured, these values are composited in various manners as seen in Report 3.1, Measurement Systems Bases, Table 1, to create the absolute (natural) units or scales of the Squigs, Stoney, and Planck systems.

These same data are needed again to create the Samanthan Purrfect Scales as a system scientifically similar to the Terran Squigs Scales. In the case here though there is the added difficulty that the values of these data as measured by the Samanthans in their relative or common system of units obviously are not known. There is no choice but to start with the values of these key data as measured by humans and convert or map them over to their equivalent values in the Samanthan common system of units.

This data is non-relativistic so that is one less issue about which to worry. Additionally, the nature of this data is that of state properties. No processes are involved here. There is no need to worry about path dependent values (yet). The issue of path dependency raises its head soon enough, and is discussed in Section 3 below.

Before moving on, there is one possible objection to consider or else just an issue which is probably best to raise now and clarify. The absolute or natural physics scale systems for distance L, duration T, mass M, and charge Q are derived from the three force constants and the quantity of charge of the electron. These force constants were measured, are described, and defined as having inverse square distance relationships. This should not be allowed to derail the thinking here though. Referring back to the gas law demonstration, there pressure has units of force/distance^2 and volume is a quantity of distance^3. But whether the distance cubed was mutually perpendicular to itself, perpendicular to the applied force of the pressure, or parallel with the applied force did not matter. Just using the proper unit conversions between the two systems of scales, American Industrial, AI, and SI metric in that case, was sufficient to correctly maintain a proper description of the gas universe under discussion. Just using straight forward conversions of units should be sufficient here. Any further adjustments should not be needed, such as inversely squaring the numerical values from one system to the other anytime the units of distance are involved.

At this point some persons might object, what guarantee is there that the values converted from Terran to Samanthan are the values that the Samanthans' actually measured? Simple, the stipulation was made that the Samanthans were measuring the same physical universe as the humans. The universal force constants all have the same inverse distance squared strengths on the objects affected by them. These three universal force constants and the elementary charge, used to construct the systems of units are absolute quantities. That is, these quantities reveal something about the structure or framework of the realm under discussion, the subatomic realm.

Other persons might object that by these conversions, the Samanthan absolute system of units is seeded with the same "coincidences" that make the human absolute physics Squigs system of units work out. "Work out" meaning producing the key required mathematical-geometric constants exactly as they were developed in the two reports which describe the leptons and photons. The validity of the calculus work in these reports is still being denied. And such claims and a pretense is continued that the resulting derived constants are merely gigantic coincidences, 5 chances in 10^{13720}. The pretense is that somehow by great precognizance this set of scales for the original metric system was conceived such that now the results of this overall work are "accidentally" obtained as they are. This is with the unit of length, the meter, being related as it originally was to the circumference of the earth on a pole-to-pole path, and the unit of time being related to terrestrial and solar temporal cycles. Obviously, such an objection is false. All that is needed is a reminder that the conversion constants from Samanthan to Terran are random numbers. If the same key mathematical-geometric constants of this work are verified using the Samanthan Purrfect system of units then this supposed gigantic coincidence will have squared itself.

Having put down these two objections, the work here should proceed. The input data necessary to build the absolute physics scale systems is listed in Table 2, along with their essential conversions between the Samanthan Purrfect and Terran Squigs systems. Two side-by-side arbitrary, independent, but not completely disconnected absolute scale systems can now be built and used.

Table 2 Systems Of Scales – Critical Data Conversions

Table 2.1 Force Constant Conversions

	Samanthan Feline System	1 Sam Unit = X Terran SI Units	Reciprocals	Terran Human SI Unit Set	Comment
G Gravitational Constant $(L/M) \times (L/T)^2$	$(t/p) \times (t/n)^2$ $4.583,104 \times 10^{-12}$	14.559,094	0.068,686	$(m/kg) \times (m/s)^2$ **$6.672,590 \times 10^{-11}$**	Measured
ε_o Electric Constant $Q^2/(ML) \times (L/T)^{-2}$	$b^2/(pt) \times (t/n)^{-2}$ $5.817,517 \times 10^{-03}$	$1.521,988 \times 10^{-09}$	$6.570,352 \times 10^{+08}$	$C^2/(kgm) \times (m/s)^{-2}$ **$8.854,188 \times 10^{-12}$**	Definition
μ_o Magnetic Constant $(M/Q^2) \times (L/T^0)$	$(p/b^2) \times (t)$ $1.236,297 \times 10^{-14}$	$1.016,452 \times 10^{+08}$	$9.838,140 \times 10^{-09}$	$(kg/C^2) \times (m)$ **$1.256,637 \times 10^{-06}$**	Definition
Electrical Charge Definition $Q = (LM)^{1/2}$ unit conversion @ 1 meter inv sq law adj to 2.864... meter Ultimate Ratio	$(tp)^{1/2}$ 0.523,959 0.063,864,5	1.908,546 15.658,144	0.523,959 0.063,864,5	$(kgm)^{1/2}$ **1.0** 0.121,888	Definition

Table 2.2 Additional Data From Systems

Measured Data	Samanthan Feline System	1 Sam Unit = X Terran SI Units	Reciprocals	Terran Human SI Unit Set	Comment
Electron Mass	pudg-os $7.163,137 \times 10^{-31}$	1.271,704	0.786,346	kilograms **$9.109,390 \times 10^{-31}$**	Measured
Elementary Charge	blivets $8.463,532 \times 10^{-16}$	$1.890,367 \times 10^{-04}$	$5.282,517 \times 10^{+03}$	coulombs **$1.602,177 \times 10^{-19}$**	Measured
Photon Constant $(ML)(L/T)$	$(pt)(t/n)$ $7.154,850 \times 10^{-35}$	9.260,958	0.107,980	$(kgm)(m/s)$ **$6.626,076 \times 10^{-34}$**	Measured

Step 3: Having done the preliminary steps necessary to find numerical values for the universal force constants in the Samanthan Feline system of relative scales, the two side-by-side absolute physics systems of measurement can be laid out. The Samanthan Purrfect counterparts to the Terran Squigs units have identical definitions in terms G, ε_o, μ_o, and e. The original details of the definitions of the absolute Squigs distance L, time T, mass M, and charge Q were given in Report 3.3, Measurement Systems Bases, Table 1. Here for the Terran units these were repeated in Step 1 above. The top rows of Table 3

above show the numerical values of these absolute measurement units or parameters for both the Samanthan and Terran systems.

These four absolute quantities L, T, M, Q in the two side-by-side systems are then the bases for the remainder of the work in this report. Using the values for pure distance, time, mass, and charge all the combinations of units typically found in scientific and engineering calculations can be created and listed in Table 3 just as was done in Table 1.2 for the relative measurement units. Except now these quantities are in terms of their absolute references.

Tables for various combinations of the force constants raised to small powers can also be set up and the measurement units are found to fall where they do. Some of these combinations of importance were seen in Report 3.3, Measurement Systems Bases, Section 4, Table 2, for the Squigs absolute physics units only. Cross species knowledge of this material is not needed.

These listings in Tables 3 should be clarified. How should they be read and used? Each row is in fact an equation and should be read as such. For example, read left to right, the row designated velocity with absolute parametric units of L/T can be read as;

1 absolute unit of velocity L/T for the Samanthan Purrfect System of units = $1.1792 \times 10^{+8}$ t/n in the common or relative Samanthan Feline measurement system.

Likewise;

1 absolute unit of velocity L/T for the Terran Squigs System of units = $2.9979 \times 10^{+8}$ m/s in the common or relative human SI measurement system.

Generally the rows read as;

1 absolute parameter (set of units) = some number (in scientific notation) of relative units

These absolute to relative relations have the mathematical form $Y = 0X^0 + bX^1$, or involve multiplication factors. Note this is very different from the absolute to relative relations of the gas law demonstration which had the form $Y = aX^0 + 1X^1$, which involves an additive adjustment or offset. Obviously each row of equations can be used to create conversion factors. Dividing across the equal sign to produce a conversion factor produces;

some number of the common parameter / 1 absolute unit = 1, or vice-a-versa for the reciprocals.

For example for the quantity of distance in the Terran human system the following absolute : relative conversion factors are obtained;

$4.893\ldots \times 10^{-36}$ common measurement meters / 1 Squigs distance, or equally $2.043\ldots \times 10^{+35}$ l_{Sgs} / 1 m

Creating these conversion absolute-relative factors is very simplistic. What needs to be remembered is that these numerical conversion constants have two sets of units, always absolute and relative, which come with them. The fanatical fixation of some particle physicists for canceling out, doing away with the measurements units, and declaring victory, is not to be done.

Again, before moving on, some peculiarities about the absolute scales which have been created need to be recognized and considered. There are some distinct and critical differences from the analogy with the gas law demonstration. The parameter measurement scales for the gas law discussion are truly independent; pressure, volume, moles, and temperature. These four parameters were related by one parameter connector or conversion constant, the gas constant. In science that is all that is important anyway, this relationship between the parameters.

Here the four absolute measurement scales are completely intertwined. The value of the Purrfect or Squigs distance unit L has built into it from its very generation the values of the bases of the other three units, raised to various powers. Further these powers are not necessarily integer. This is also true for the absolute T and M scales. The absolute scale for the second property related to the particles Q for charge is the only one which has a simple 1:1 first order relationship with the underlying bases. Further this underlying basis for charge, e, scales all the absolute scales L, T, M, and Q in the same simple linear multiplier fashion. The many implications of this intertwinement of the absolute scales were discussed in Report 3.3, Measurement Systems Bases, Section 4.

Table 3 Systems of Scales – Absolute Scale Conversions

Absolute Unit Parameter Combinations										
	Input measurement unit combination, exponents **Absolute Units**				Derived force constant combinations, exponents				**Samanthan Purrfect System**	**Terran Squigs System**
									Values in Relative or Common Units	
	L	T	M	Q	G	ε_o	μ_o	e		
Radial Distance	**1**				**0.5**	**0.5**	**1**	**1**	1.708532×10^{-36}	4.893753×10^{-36}
Radial Time		**1**			**0.5**	**1**	**1.5**	**1**	1.448950×10^{-44}	1.632380×10^{-44}
Property 1, Mass			**1**		**-0.5**	**-0.5**		**1**	5.183259×10^{-09}	6.591572×10^{-09}
Property 2, Charge				**1**				**1**	8.463531×10^{-16}	1.602177×10^{-19}
Velocity, 1st derivative	1	-1			0	-0.5	-0.5	0	$1.1792 \times 10^{+08}$	$2.9979 \times 10^{+08}$
Acceleration, 2nd deriv	1	-2			-0.5	-1.5	-2	-1	$8.1380 \times 10^{+51}$	$1.8365 \times 10^{+52}$
Jerk, 3rd derivative	1	-3			-1	-2.5	-3.5	-2	$5.6164 \times 10^{+95}$	$1.1250 \times 10^{+96}$
Jounce, 4th derivative	1	-4			-1.5	-3.5	-5	-3	$3.8762 \times 10^{+139}$	$6.8921 \times 10^{+139}$
Velocity^2	2	-2			0	-1	-1	0	$1.3904 \times 10^{+16}$	$8.9876 \times 10^{+16}$
Velocity^3	3	-3			0	-1.5	-1.5	0	$1.6394 \times 10^{+24}$	$2.6944 \times 10^{+25}$
1st moment	1		1		0	0	1	2	8.8557×10^{-45}	3.2257×10^{-44}
2nd moment	2		1		0.5	0.5	2	3	1.5130×10^{-80}	1.5786×10^{-79}
Momentum	1	-1	1		-0.5	-1	-0.5	1	6.1118×10^{-01}	$1.9761 \times 10^{+00}$
Force	1	-2	1		-1	-2	-2	0	$4.2181 \times 10^{+43}$	$1.2106 \times 10^{+44}$
Force / Dist		-2	1		-1.5	-2.5	-3	-1	$2.4689 \times 10^{+79}$	$2.4737 \times 10^{+79}$
Force/ Dist^2 (Pressure)	-1	-2	1		-2	-3	-4	-2	$1.4450 \times 10^{+115}$	$5.0548 \times 10^{+114}$
Viscosity	-1	-1	1		-1.5	-2	-2.5	-1	$2.0937 \times 10^{+71}$	$8.2513 \times 10^{+70}$
Energy x Time	2	-1	1		0	-0.5	0.5	2	1.0442×10^{-36}	9.6706×10^{-36}
Energy (Work, Heat, PV)	2	-2	1		-0.5	-1.5	-1	1	$7.2068 \times 10^{+07}$	$5.9242 \times 10^{+08}$
Power (Energy / Time)	2	-3	1		-1	-2.5	-2.5	0	$4.9738 \times 10^{+51}$	$3.6292 \times 10^{+52}$
Human Def'n of Charge	0.5		0.5		0	0	0.5	1	9.4105×10^{-23}	1.7960×10^{-22}
Spatial Density, Mass										
Linear	-1		1		-1	-1	-1	0	$3.0337 \times 10^{+27}$	$1.3469 \times 10^{+27}$
Area	-2		1		-1.5	-1.5	-2	-1	$1.7756 \times 10^{+63}$	$2.7524 \times 10^{+62}$
Volumetric	-3		1		-2	-2	-3	-2	$1.0393 \times 10^{+99}$	$5.6242 \times 10^{+97}$
Spatial Density, Charge										
Linear	-1			1	-0.5	-0.5	-1	0	$4.9537 \times 10^{+20}$	$3.2739 \times 10^{+16}$
Area	-2			1	-1	-1	-2	-1	$2.8994 \times 10^{+56}$	$6.6900 \times 10^{+51}$
Volumetric	-3			1	-1.5	-1.5	-3	-2	$1.6970 \times 10^{+92}$	$1.3671 \times 10^{+87}$

Step 4: Before going on to the ultimate objectives, some practice calculations and comparisons using the absolute systems are in order. Besides practice, these examples show some very profound results of using these simple absolute frameworks that have been set up to describe aspects of the physical world. As is found, the inherent nature of these mathematical systems, not the fact that they are overlaid on any particular physical system, is responsible for the results that are obtained.

Several simple steps are done in Table 4 which follows.

1 A parameter is chosen which the "input" data is to represent. The power to which this parameter is being raised is also decided, as if this parameter were being used in an equation somewhere. Both of these choices are basically arbitrary, with no particular rationale for either one, other than keeping the demonstration simple.

2 What is essentially a random number is picked and entered into the Samanthan Feline system of relative scales as if this was actually a measured value or data item from some experiment.

3 Knowing the parameter or variable and the power to which it is raised, the appropriate conversion factor to the Terran relative SI units of measurement from the Samanthan system is determined. These conversions can be looked up in Table 1.1 and raises to the appropriate powers.

4 The "input" data is then converted to the Terran SI set of units from the Samanthan Feline system of measurements.

These first 4 steps are represented in the first row, from left to right, of each set of values in Table 4.

5 Next in the second row of each presentation, the appropriate conversion factors are entered to convert the data from their respective relative measurement systems to their absolute measurement systems. Again knowing the parameter and its power, these conversion constants can be created from the definitions at the top of Table 3. These conversions are formulated as simple multiplying factors.

6 Finally in the third row of each set, the relative input data is simply multiplied by their conversion factors to import them into their respective absolute measurement systems.

As seen these 6 simple steps produce the identical absolute values in the two systems, no matter what the parameter nor to what power it is raised. There is a caveat here. For this "equilibration" of values to work, the absolute conversion factors between the two systems MUST BE identical with their respective relative conversion factors between the systems. With the two side-by-side systems as defined and set up, this is the case. To save space the interspecies absolute unit conversion factors were not listed in Table 3. A few simple ratios of the values listed there show that the absolute quantities do have the same relations as their relative counter parts in Tables 1.1 and 1.2. Finally as seen at the bottom of Table 4, multiple parameters can be combined into single blocks and produce the same results. This should be obvious anyhow.

What is important here is this process of importation of the relative values into absolute scale systems. This, in the case of the relative to absolute systems, is a process of ratioing. This process carries units with it, as follows.

Line 1; Relative input quantity – with relative units
Line 2; Conversion factor (or reciprocal) – with; units of the absolute scale / unit of the common scale
Line 3; A scaled value -- with units in the absolute system

Or making an equation on one line there is simply, The scaled value in the absolute system of units = relative input value (x or /) with a conversion factor

As seen in both Report 3.1, Measurement Units & Scales and Report 3.3, Measurement Systems Bases, what is important when mapping a value from one scale to another is that the conversion factor does more than just move the value. The conversion factor also correctly converts the value's measurement units or else the equation doesn't make sense. For example; the conversion factor in the first block of values, for distance, in the Samanthan systems has the units of "tails / tail", "absolute tails / tail", or "Purrfect tails / common tail". This is clearly not the same as having a tailless conversion factor.

Table 4 Systems of Scales – Scale Values Equilibrated

	Parameter(s)	Parameter Power	Samanthan Feline System (Random Input)	Conversions To Terran	Terran Human SI Unit Set (Derived Values)
Input Value	$Distance^1$_rel	1	17.9642	2.8643	51.4550
Scale Factor	L^1_abs / L^1_rel		$5.8530 \times 10^{+35}$		$2.0434 \times 10^{+35}$
Scaled Value	$Distance^1$_abs		$1.0514 \times 10^{+37}$		$1.0514 \times 10^{+37}$
Input Value	$Distance^{-1}$_rel	-1	17.9642	0.3491	6.2718
Scale Factor	L^1_rel / L^1_abs		1.7085×10^{-36}		4.8938×10^{-36}
Scaled Value	$Distance^{-1}$_abs		3.0692×10^{-35}		3.0692×10^{-35}
Input Value	$Time^2$_rel	2	37.7285	1.2692	47.8856
Scale Factor	T^2_abs / T^2_rel		$4.7631 \times 10^{+87}$		$3.7528 \times 10^{+87}$
Scaled Value	$Time^2$_abs		$1.7971 \times 10^{+89}$		$1.7971 \times 10^{+89}$
Input Value	$Time^{-2}$_rel	-2	37.7285	0.7879	29.7258
Scale Factor	T^2_rel / T^2_abs		2.0995×10^{-88}		2.6647×10^{-88}
Scaled Value	$Time^{-2}$_abs		7.9209×10^{-87}		7.9209×10^{-87}
Input Value	$Mass^3$_rel	3	19.2442	2.0566	39.5783
Scale Factor	M^3_abs/M^3_rel		$7.1811 \times 10^{+24}$		$3.4917 \times 10^{+24}$
Scaled Value	$Mass^3$_abs		$1.3819 \times 10^{+26}$		$1.3819 \times 10^{+26}$
Input Value	$Mass^{-3}$_rel	-3	19.2442	0.4862	9.3571
Scale Factor	M^3_rel/M^3_abs		1.3925×10^{-25}		2.8640×10^{-25}
Scaled Value	$Mass^{-3}$_abs		2.6798×10^{-24}		2.6798×10^{-24}
Input Value	$Charge^{0.5}$_rel	0.5	24.1160	1.3759×10^{-02}	0.3318
Scale Factor	$Q^{0.5}$_abs / $Q^{0.5}$_rel		$3.4374 \times 10^{+07}$		$2.4983 \times 10^{+09}$
Scaled Value	$Charge^{0.5}$_abs		$8.2895 \times 10^{+08}$		$8.2895 \times 10^{+08}$
Input Value	$Charge^{-0.5}$_rel	-0.5	24.1160	$7.2681 \times 10^{+01}$	1752.77
Scale Factor	$Q^{0.5}$_rel / $Q^{0.5}$_abs		2.9092×10^{-08}		4.0027×10^{-10}
Scaled Value	$Charge^{-0.5}$_abs		7.0185×10^{-07}		7.0158×10^{-07}
Input Grouping	(ML)(L/T)_rel	1	37.6842	9.2610	348.9914
Scale Factor	abs / rel		$9.5764 \times 10^{+35}$		$1.0341 \times 10^{+35}$
Scaled Value	(ML)(L/T)_abs		$3.6088 \times 10^{+37}$		$3.6088 \times 10^{+37}$
Input Grouping	(M^1/L)_rel	1	13.3559	0.4440	5.9298
Scale Factor	abs / rel		3.2963×10^{-28}		7.4243×10^{-28}
Scaled Value	(M^1/L)_abs		4.4024×10^{-27}		4.4024×10^{-27}
Input Grouping	(Q^2/L)_rel	1	131.4224	1.2511×10^{-08}	1.6443×10^{-06}
Scale Factor	abs / rel		$2.3852 \times 10^{+06}$		$1.9064 \times 10^{+02}$
Scaled Value	(Q^2/L)_abs		3.1347×10^{-04}		3.1347×10^{-04}

This absolute value can be called by many names; adjusted, ratioed, reduced, scaled, etc. But what is important is that this value has the parametric units of the absolute system. In Table 4 there are two identical or "equilibrated" absolute numerical values with different units attached. These values could be thought of as being placed on different scales, with different scale sizings or spreads. There is some mathematical universal quality of this process of importing the relative values into and placing them on their respective absolute scales. This is inherent in the nature of the scales are being used; linear, zero based, etc and is NOT something magical nor a grand conspiracy or coincidence of the starting data nor of its relative scales.

This is not to say that the "equilibrated" absolute values have any relevance or meaning. These procedures are similar to the Buckingham Pi Theorem. There is a guarantee that certain mathematical procedures can be performed. There is not any guarantee that the results of the procedure have any meaning. What is learned here is that any random value, with any random set of units, from any random measurement scale structure, can be "equilibrated". Care needs to be taken that only meaningful or valid data is input into the procedure. The procedure always works, but critical thinking is beyond its scope. That is the responsibility of the scientific investigator. In short this procedure from the analyses of measurement systems needs to be used very selectively and with great care.

With this caveat in mind, the derivations or demonstrations are in reach, that the constants as discovered in the lepton and photon reports are valid, producible from any system, and not just flukes or coincidence of the SI set of units. In short the constants discovered are measurement system independent.

First though, two other major and critically important topics concerning procedures using these absolute physics measurement systems need to be discussed to finish filling out a well rounded grasp of this mathematical working tool.

3 Further Preliminaries With Dual Systems

3.1 Analysis Of Equilibration Procedure And Table 4

Upon reviewing the "equilibration" procedure and seeing the results in Table 4 an alert reader may now be suspicious as how to "prove" that certain absolute quantities can be used to validly predict the objective relative quantities of the previous lepton and photon reports. As a warning of things to come, there appears to be no reason as to why the simple little three step procedure used here can not be reversed. The numerical values in side-by-side systems of absolute scales or units can be used as the starting quantities and converted backwards to their values in relative measurement systems of units. Ultimately this is what is done in the objective proofs to produce the relative numerical values of the elementary electron charge and the electron mass with their correct relative units. While this is not exactly what is done, this is a close enough description for the purposes right now.

BUT from the layout in Table 4 a problem is found, a major problem, a critical show stopper. As this table has been explained and laid out, the procedure is path dependent and is irreversible. The operators are uni-directional or the equations which cannot be inverted. This is a pretty radical claim. How can this be said? Numerically the process, procedure, conversion, transform, or mapping of values from the relative to the absolute merely involved multiplication or division. How can this be said to be path dependent or irreversible?

Examining the final result, which appeared so desirable, identical resultant numerical values have been produced. This is where the problem lies. For example in the first block of Table 4 with distance raised to the first power, $1.0514 \times 10^{+37}\ l_{Sam}$ was produced in the Samanthan Purrfect absolute system of units in column 4 and $1.0514 \times 10^{+37}\ l_{Sgs}$ was produced in the Terran Squigs or human absolute system of units in column 6. The fact that these values are numerically identical combined with the entire Table 3 of conversion factors between the relative and absolute systems results in the path dependency.

The left hand side of Figure 1.1 following illustrates the problem. Suppose as a Path 1 Step 1, a path is taken from relative value A in the Samanthan system of units to the absolute value A* in the Samanthan system of units. Then as Step 2, the absolute A* is converted into the absolute B* of the Human system of units. Now suppose as Path 2 Step 1, a path is taken from the relative value A in the Samanthan system of units to the relative Terran Human value B. Then as Step 2, the relative B of the Terran Human is converted to the absolute B*. These two different paths do NOT result in the same B*. Not only do they not produce the same B*, they are guaranteed not to do so.

FIGURE 1.1

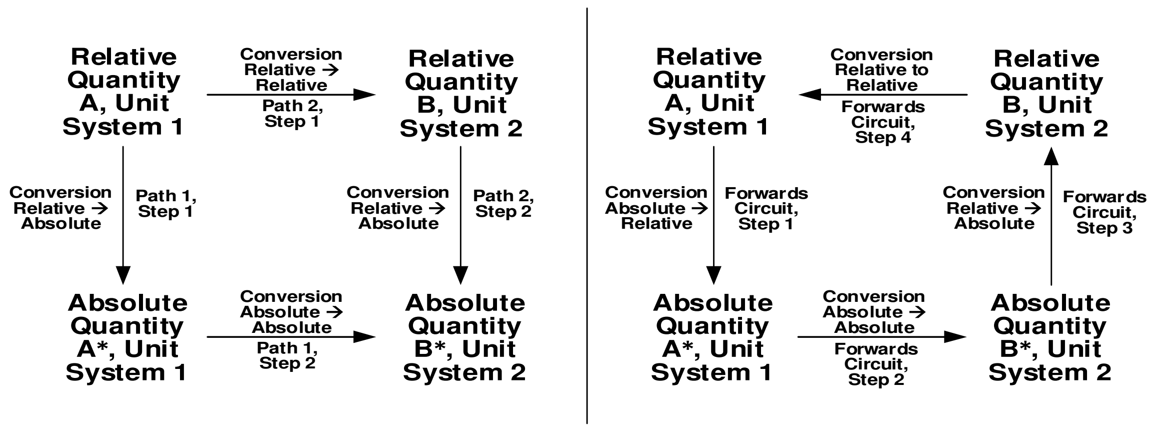
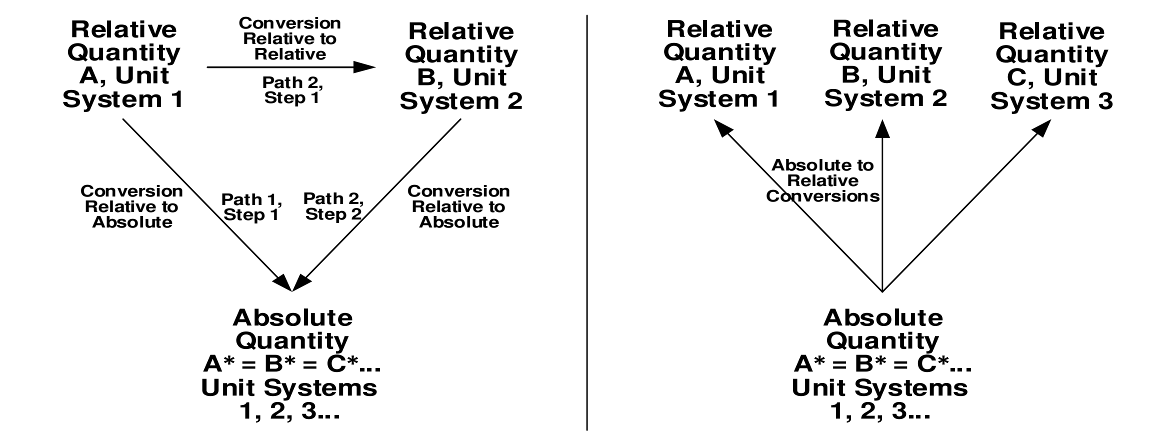


FIGURE 1.2



The two conversions from Samanthan to Human, relative to relative and absolute to absolute, have the same conversions factors, numerically identical. This is actually a good thing. One less issue with which to hassle. At the same time the two conversions, Samanthan relative to absolute and Human relative to absolute, have different conversion factors. This is also guaranteed by the way the two relative and absolute systems were set up.

Going completely around the four legs of the circuit on the right hand side of Figure 1.1, either direction, Clockwise A → A* → B* → B → A or Counter Clockwise A → B → B* → A* → A The value of A which is the final result is not the same as the starting one. This is a highly undesirable state of affairs in both science and engineering, particularly here where there is only a mathematical process. In real world, processes such as those in which there are energy losses, this non-return to the original state of affairs in expected, calculated, and planned upon. But here there are only a series of mathematical transforms each only involving multiplication or division. Path dependency or dependency upon the order of operations is not acceptable with these simple operators.

Fortunately, there is a way out of this mess. Because Table 4 is a table and is shown with rows and columns it depicts a false picture, one which has vertical and horizontal legs, or is rectangular or square. A second look at Table 4 is needed. In each demonstration Row 3 lists the result of the operations as having absolute units for the quantities of L, T, M, and Q. These units need to be though of as universal conceptual units or meta units, place holders for whatever systems of absolute units are going to be used. The results of the equilibration operations or procedure represent any or all systems of absolute units SIMOULTANEOUSLY. Previously the table was read as producing 1.0514 x 10^{+37} l_{Sam} one time and 1.0514 x 10^{+37} l_{Sgs} another time, when a correct reading would have been as realizing the 1.0514 x 10^{+37}L had absolute units of length in any of an infinite number of systems, all at the same time. This is a hard lesson to learn, but now offers wonderful calculational freedom, bi-directional operators, reversible transforms.

Figure 1.2 is the interpretation that is needed. The equilibrating operations do not produce a rectangle of related values, but produce a triangle of relations. The lower point of the triangle is simultaneously A*, B*, C*, ... The problem is with the original perception, not the operations. When going around the legs of the circuit in Figure 1.1, A* and B* were viewed as being distinct, because units from different systems had been attached to them. For every set of units the perception had been that a different entity X* was being created. This is a false view. The correct view is that there is only one X* and this quantity has many different names, or sets of units attached to it. Lest someone gets carried away, a reminder is needed that the topic here mathematics, not religion.

3.2 Why The Misperception Of Table 4

Before leaving this discussion, a brief consideration is needed of how this mess was created. How was the false perception developed that A*, B*, C*, ... were distinct unitwise when they had identical numerical values? One answer is that the only absolute measurement systems with which scientists are familiar was held too tightly. An idea which is deeply ingrained in all engineers, scientists, and other technical persons was fixated upon. This concept is that a universal constant must have different numerical values when it is placed in different measurement systems. This was seen in the gas law example, that the universal constant R takes on different numerical values as problems are posed from one measurement system to another.

A key problem is just seen in the sentences above. The word universal has been switched, substituted for, confused with the word absolute. The universal constants R, G, ε_o, μ_o… as they are called are not really universal constants. The concepts, relationships, and physical properties for which they stand are universal, yes. But their statements with numerical values and measurement units are only really absolute in scope. In short the words and concepts or meanings of universal and absolute have gotten themselves slurred together. The universal gas law PV = nRT is a universal gas law. But the gas law constant R 82.058 (atm cm^3) / (gmole °K) is only really an absolute constant, not a universal one.

The word absolute was described or defined in Chapter 3.1, Measurement Units and Scales. Absolute tells the user something about the structure or framework of the topic with which they are dealing. Again as defined in Chapter 3.1, universal means or has a scope which is independent of any measurement system. This is a higher level of abstraction than merely being absolute.

Specifically returning to the issue at hand here, first the evidence here was ignored, that identical numerical values had been produced. The concept or words "distinct absolute measurement systems" had become the only focus. Looking at the composite quantities in Table 4, (ML)(L/T), M/L, and Q^2/L, these quantities could have been or even were thought of as statements of universal laws just like the gas law constant R. Thinking of such values as statements of universal laws is a good practice, even though here in Table 4 they are only random examples. This is exactly what is shown for certain specific examples later on, that the values of concern are in fact universal laws. But here the fact that the values above were identical numerically was ignored. This issue is raised now because this tendency to disconnect continues when moving on to the key demonstrations of concern.

How then can the statement of a universal law have the same numerical value upon being transported from measurement system to measurement system? This is the crux of this whole report and the next two. This is the crux of the complete aversion for this entire body of work by some highly in-sensed physicists. They have raised the incessant, "What is the value of the meter was different"? How can the mathematical-geometric numerical constants developed in the lepton report retain their values once they have been assigned units and then the measurement system changes? The two constants M/L, and Q^2/L of the leptons are the focus of this contention. The constant for the photon (ML)(L/T) developed in the photon report is ignored because it is viewed as a unitless ratio. As is seen in Section 5.2 below this last view is false, incorrect.

Here very clear a distinction needs to be made between the universal gas law constant R and the universal mathematical-geometric constants of this entire body of work. The gas law and its constant apply to real world physical bodies of gases. The value of R was experimentally developed by making measurements on such bodies. The measurements of these real physical bodies were made using existing measurement systems. This constant and so many others that are similar have no choice but to change their numerical sizes as they are dragged from one measurement system to another.

<u>On the other hand, the universal constants of this body of work are, or were derived from, mental conceptual constructs. As such they exist in the arbitrarily sized world of mathematics and geometry. As such they are assigned universal, meta, generic parameter, or place holder units. They need to be imported into the real physical world units systems, both absolute and relative, of whatever intelligent beings before they can be applied. Such mathematical constants or mental laws can in fact take on the measurement units of such different systems as needed and still retain their original numerical values.</u>

This then is the key difference and conceptual stumbling block for detractors of this body of work. Real world measured physical constants are embedded into specific measurement systems from the very get-go. <u>The mathematical-geometric constants of this work are derived from mental conceptual constructs and as such have units but these units are universal, meta, or place holders.</u>

This is exactly what Max Planck had in mind and was attempting to create with his "natural" units. Again repeating from Chapter 3.3, Planck emphasized the universality of his units with the now famous statement,"These necessarily retain their meaning for all times and for all civilizations, even extraterrestrial and non-human ones, and can therefore be designated as "natural units"...". In an almost lawyer like hair splitting manner Planck's statement needs to be disected. Yes, the meaning of Planck's "natural" units is indeed universal. But their very statements or actualization applying to the manifest world, again with numerical values and measurement units, are only absolute in scope. They only apply to or describe the subatomic physics realm from the view of human metric based science. In short Planck's "natural" units are only absolute, not universal at all. This is not at all what he was claiming.

3.3 Mixed Relative / Absolute Conversions

In Table 4 all the demonstrations started out with relative values involving one or more of the measurement parameters. These then were uniformly en-mass converted to their equivalent absolute counter parts. Unfortunately several of the conversion constants that are needed in the work with the wave forms (particles) do not have this simplistic form. What are needed in this work are mathematical forms which have a relative unit divided by some other absolute unit. Several examples should be worked to practice the procedural techniques which are required to handle this form. Table 5 goes thru several such examples in the same format as was used in Table 4.

Table 5 Mixed Relative Numerator Parameter / Absolute Denominator Parameter Equalizations

	Parameter(s)	Parameter Power	Samanthan Feline System (Random Input)	Conversions To Terran	Terran Human System (Derived Values)
Input Value	Mass^{1}_rel	1	19.2442	1.2717	24.4729
Input Value	Distance^{1}_abs	-1	1.7085×10^{-36}	2.8643	4.8938×10^{-36}
Scaled Value	M_rel / L_abs		$1.1264 \times 10^{+37}$		$5.0008 \times 10^{+36}$
Ratio of Scaled	Feline / Human		2.2523		
Factor Needed by Humans To Equalize			(L^{1} Rel Terran/Sam) / (M^{1} Abs Terran/Sam)		
Input Value	Mass^{1}_rel	1	19.2442	1.2717	24.4729
Input Value	Time^{1}_abs	-1	1.4489×10^{-44}	1.1266	1.6324×10^{-44}
Scaled Value	M_rel / T_abs		$1.3281 \times 10^{+45}$		$1.4992 \times 10^{+45}$
Ratio of Scaled	Feline / Human		8.8589×10^{-01}		
Factor Needed by Humans To Equalize			(T^{1} Rel Terran/Sam) / (M^{1} Abs Terran/Sam)		
Input Value	Charge^{2}_rel	2	24.1160	3.5836×10^{-08}	8.6422×10^{-07}
Input Value	Distance^{1}_abs	-1	1.7085×10^{-36}	2.8643	4.8938×10^{-36}
Scaled Value	Q^{2}_rel / L_abs		$1.4115 \times 10^{+37}$		$1.7660 \times 10^{+29}$
Ratio of Scaled	Feline / Human		$7.9928 \times 10^{+07}$		
Factor Needed by Humans To Equalize			(L^{1} Rel Terran/Sam) / (Q^{2} Abs Terran/Sam)		
Input Value	Charge^{2}_rel	2	24.1160	$3.5836 \times 10^{+08}$	8.6422×10^{-07}
Input Value	Time^{1}_abs	-1	1.4489×10^{-44}	1.1266	1.6324×10^{-44}
Scaled Value	Q^{2}_rel / T_abs		$1.6644 \times 10^{+45}$		$5.2942 \times 10^{+37}$
Ratio of Scaled	Feline / Human		$3.1438 \times 10^{+07}$		
Factor Needed by Humans To Equalize			(T^{1} Rel Terran/Sam) / (Q^{2} Abs Terran/Sam)		

What is found here is as expected. Some extra manipulations of the derived system are needed, the Terran Human system in this case, to equalize the numerical result with that of the original system. The reasons for this are obvious. The input value for the numerator of the expressions are relative values which are then never converted into absolute values. Likewise the input value for the denominator of the expression is an absolute value which was never imported from a relative form.

3.4 Independence Of Absolute Quantities?

Once the bases for the parallel absolute Samanthan system of units were established in Table 2.1, some other corresponding key particle data was shown in Table 2.2. Next Table 3 with side-by-side practical engineering quantities was developed. This had implied interspecies or inter-measurement system conversions. The only conversions involving absolute quantities that were made in Table 4 were from relative to absolute within the given systems, not between them. Finally returning to Table 5 there examples were found of direct cross system absolute conversion factors.

Here is where a BIG caveat is needed. The ASSUMPTION has been made that both the absolute measurement systems and the realms that they represent are unconstrained. Absolute conversion factors have been blithely thrown around on paper.

Thinking of the real physical world first a question arises, what if in fact the systems, subatomic wave forms or particles, do have constraints? For example, the Heisenberg Uncertainty Principle would be a constraint upon what can and cannot be done. Additionally a reminder is needed of the original objectives of this research. These were to discover mathematical model(s) for the wave form (particle) systems. The whole objective of this research was exactly to find constraints which interconnected or pinned down some of L, T, M, Q as applied to this absolute realm. A reminder or consideration is needed that some of the interspecies conversions which have just been created probably are not valid.

An analogy to the gas law example would be; what if a scientist blithely sets about changing the P or V of a container of gas, without considering all of the gas system's P, V, T, and n. Such practice would be ignoring that there is a "law" resulting in a parameter connector, the gas law constant, which links the four parameters into an inseparable and totally interdependent whole.

Again a general reminder is needed that the world size realm of George Johnstone Stoney and the particles, the electron family, is at a scale 36 orders of magnitude smaller in distance than humans and 44 orders of magnitude smaller than the human invented second. The electron is 33 orders of magnitude smaller in mass than a human and the quarks appear to inhabit a world of 4 spatial dimensions. Futher the little critters of investigation are really only just wave forms or energy bodies and do not really have any "solid" form. Assuming or trying to impose laws and physical property inter-relations upon them based upon the human world experience and mechanics is a seriously dubious proposition.

Of great importance here is the fact that scientists do not necessarily know how many parameter connectors, conversion constants, or relations there are between the four scales L, T, M, and Q of this Stoney scale size realm. Again, these relations are what are important or relevant. Additionally and maybe more importantly, whatever the real number of interconnecting laws between the parameters of this size realm, physicists do not know which ones are independent or a-priori. At this time physicists only seem to have found one with which they are happy, the photon energy or Planck constant.

Secondly consideration should be returned to the original relative measurement system upon which these entire interspecies conversions are based. What if one of the mental conceptual overlays upon the real physical world, the measurement system of some intelligent species, is not completely independent as has been claimed from the outset of this report? What if one or more of the scales for the system of relative units, from which the absolute measurement systems arise, are in fact not independent but are interlinked with the other measurement scales? That is, what if one of the measurement systems has internal self constraints? What does this do to the objective demonstrations of this report? This is of course to show that the subatomic scaling factors, which were used in the lepton and photon reports, with their mixed unit forms are measurement system independent or have fixed mathematical-geometric numerical values with universal meta units attached. This is analogous to asking, what if a common scalar value is multiplied by several vectors, L, T, M, and Q, when in one system the units scales, the unit vectors, for several of these vectors reference or are dependent upon some of the other vectors? This issue arises very shortly as a pattern is laid out showing the measurement system independence for the constant for the lepton mass per radial distance.

4 Input

Now that some absolute systems have been developed and an outline has been demonstrated of how to apply them to produce potentially beneficial information, a discussion of input data is needed. Later the details of the procedures above are repeated and delved into, "formalized". Here the input data that is available needs to be investigated.

The a-priori input data available in this work is very limited. There are the three measured force constants; G, μ_o, ε_o. There are three data points concerning the the particles; m_e, e, *h*. And finally there is the one definition in the Terran relative system intertwining the scales by defining the unit of charge (C) as, amps x time. Amps in tern were defined as a measure of force/distance. Ultimately a coulomb is equal to some value of the first property related to particles, mass, multiplied by the intelligent species conceptual measuring stick of distance, as $(LM)^{1/2}$. The values of these seven quantities as defined or measured by humans are listed in Tables 2.1 & 2.2.

An important reminder is that while the three particle properties may be considered to be absolute information since they reveal something about some of the underlying properties of the universe, these values were measured and are expressed in the relative system of scales. Likewise for the coulomb definition. Any time these values are used as inputs they must be converted to absolute units to correctly show anything about this underlying universal structure. The three force constants and the actual coulombic charge of the electron form the four bases of the absolute system and have other problems. If their measured relative values are stated in the absolute system, they simply neutralize themselves to numerical values of 1.0. These four system bases are not very useful for actual calculational purposes.

Sadly what are not available are any measured input relating the properties of the fermions, specifically the mass and charge of the leptons, to the parameters of distance and time understood by large scale beings, felines and humans. Since there are no such measurements, this then is the whole objective of the work here. In the lepton and photon reports this objective is to discover or otherwise develop universal mathematical-geometric relations between the world that the particles know (mass and charge) and the world that humans know (distance and time).

Fortunately though there are four other primary input. These have been forgotten or utterly overlooked by physicists because they are never found in any of the usual listings of fundamental constants found in physics reference handbooks. These are the definitions or bases of the four scales of measurement which make up the absolute grid work system. These are listed in Section 2, Step 1, for the Terran absolute physics Squigs system of units and at the top of Table 3 for both the Samanthan and Terran systems. Further just like the common parameters, these individual absolute parameters can be raised to whatever powers that may prove useful and combined into small groupings to aid in problem solving. As seen in Table 3 an entire parallel engineering grid work of scales can be derived or produced.

These absolute system definitions can be used individually as conversions constants or can be combined as small collections of measurement units, parameter connectors. This is exactly what was done in the second set of the examples in Table 4. With the limited measured input data, the power of the procedure here lies in these absolute system definitions. Two such parameter connector inputs are needed in the development, derivations, of how the fundamental constants used in the lepton and photon reports arise.

Because of the power of this procedure and the practically unlimited ways in which the absolute system definitions can be combined, again a reminder is needed that care should be exercised in the selection of input for this "equilibration" procedure. All input should be selected carefully so as to be "meaningful" and "proper". There are many traps here, which are not delved into in this report. For example; a system definition or mathematical conversion should not be input in isolation without being connected to other meaningful measured real world physical input data in the same calculation.

Finally remembering the task or objective of scientists to act as translators or investigators, to find relationships between the quantities that the particles understand (mass, charge, color) and those that sentient beings, samanthans and humans, understand (distance, time), there should be no surprise if one unit of distance or one unit of duration needs to introduced. In some cases this is the only choice, without which there cannot be a discussion.

In the grand scheme of both mathematics and physics, the numerical quantity of one is just another arbitrary numerical value, albeit a very useful one. Further this numerical value of one as a scalar is completely sterile, neutral, or innocent. The vector like unit L, T, M, or Q which is attached to this numerical value of one is where any objections might lie. But as has already been discussed many times in Chapter 3.1, Measurement Units & Scales, without this scaling element assigned to the number, one in this case, there isn't any reference to anything real either conceptually or physically and the number is not very useful. While this introduction of such an arbitrary numerical value, one, may be disliked this step serves a valuable comparative purpose.

Such an introduction of one unit of a parameter is common and legitimate in the world of engineering when making comparisons. For example, this is done in discussions of an arbitrary one unit of height of a packed tower. This is done when the total height of the tower may be as yet unknown, undetermined, or otherwise unspecified. But because this height is the objective of some calculation or is used in the development of a correlation, some starting point is needed, and a one unit parameter scales real easily.

5 Derivation Of Essential Constants

5.1 Derivation Objectives

In the lepton and photon reports there are three conversion constants or scaled parameter connectors that are needed. In those reports they are referred to as mathematical-geometric constants since that is how they were developed, from mathematics, calculus and analytical geometry. They are;

photon (mass·distance)(distance/time), 68,517,994,75 (ML)(L/T) absolute
electron mass^1 / radial distance, 1.861432 x 10^{+05}(M relative/L absolute)
electron charge^2 / radial distance, 5.245406 x 10^{-03} (Q^2 relative/L absolute)

First the constant or parameter connector, 68,517,994,75 (ML)(L/T) absolute, the scaled photon measure of (ML)(L/T) is the most simple and straight forward mathematical-geometric constant to demonstrate. This is derived from a calculus approach in the photon report. The demonstration here is so simple that there is almost nothing to it. Never-the-less there is an important lesson to be learned concerning the units associated with this numerical value. The development of this constant is shown in Table 6 and is discussed in Section 5.2 both immediately below.

Next, the mathematical-geometric constant 1.861432 x 10^{+05}(M relative/L absolute) is the value for the scaled electron mass^1/distance, m_e/l_{Sgs}, found in the lepton report. This is derived in the lepton report from calculus considerations and the concept of radial and angular mass density structures. There are similar constants for the muon and tau, but showing how one arises and can be used here should be sufficient. There is nothing novel about the concept of mass or energy as a function of radial distance. This concept is at the core of the quantum mechanical derivation of the electron shells for the hydrogen atom.

Lastly the value of 5.245406 x 10^{-03} (Q^2 relative/L absolute) is the scaled electron charge^2/distance, e^2/l_{Sgs}. This is first used in the lepton report and resulted from vector geometric considerations. Ultimately this constant was decomposed to the value 0.162162 which is equal to the quantity of $6/(6^2 + 1^2)$. A demonstration of the universality of this constant is begun in Analyses of Measurement Systems II by attempting to match this numerical decomposition value.

To definitively prove the measurement system independence or numerical universality of these last two constants yet more needs to be learned about how to approcah this task. This takes several attempts by doing operations which are close but that somehow don't reach the desired objectives. The length of this report should not be extended indefinitely going through these almost trial and error like efforts. These learning procedures are done in Analyses of Measurement Systems II. Finally having put together what has been learned in this report and will be learned in the next, a simple and rapid demonstration of the numerical universality of these constants can be done in Analyses of Measurement Systems III.

5.2 Photon (ML)(L/T) Derivation

The demonstration of how the photon energy arises from the analysis of systems of scales has the same two steps as have already been done. A meaningful value is introduced. This is typically either relevant measured data about one of the basic properties of the universe or a basic definition concerning the system of scales in use. Then this value is scaled or reduced by multiplication / division by the unitwise corresponding collection of absolute constants for the system. That is all there is. As seen in Table 6 these two steps produce the objective value 68.517… from any system of scales.

Table 6 Systems Of Scales - Derivation Of α With Units

	Unit Combination	Samanthan Feline System (Equiv Values)	Conversions To Samanthan	Terran Human System (Input Data)	SI & Squigs Units
α Comparator For Photon Constant, (ML)(L/T)					
Measured Input	(ML)(L/T)	7.154850×10^{-35}	0.107980	6.626076×10^{-34}	(kgm)(m/s)
Scale Factor	$e^2(\mu_o/\varepsilon_o)^{1/2}$	1.044229×10^{-36}		9.670562×10^{-36}	rel / abs
Scaled Value		**68.517995**		**68.517995**	$(m_{Sgs}l_{Sgs})(l_{Sgs}/t_{Sgs})$
Multiplying Factor	2	$1.370359 \times 10^{+2}$		$1.370359 \times 10^{+2}$	
Reciprocal	α	7.297353×10^{-3}		7.297353×10^{-3}	

Now this simple demonstration should be gone back over very slowly, one step at a time to emphasize a point concerning units. As a starting point, a simple example analogy is used.

Assume, stipulate, or offer the measured data;
Given, there are 151,000,000 republicans in the US nationwide.
Now reduce or scale this number to get a statewide average;
Divide by 44
To yield the result 3,431,818 republicans (average) / state

At this point someone might object that 44 was not a meaningful number to introduce. This is exactly the point. Maybe in politics this demonstration might be valid but not in mathematics, science, nor in engineering.

Returning to the immediate topic of discussion, the photon (ML)(L/T) demonstration, proceed as follows.

Start with the measured data, the Planck constant;
The (ML)(L/T) for the photon is $6.626,076 \times 10^{-34}$ (kgm)(m/s)
Now rescale this value;
Divide by $5.286,843 \times 10^{-34}$ (kgm)(m/s) / $(m_{Sgs}l_{Sgs})(l_{Sgs}/t_{Sgs})$
To yield the result 1.253,314 $(m_{Sgs}l_{Sgs})(l_{Sgs}/t_{Sgs}) = (\pi/2)^{1/2}$ numerically

Again at this point someone might object, from where did this conversion factor or scaling constant come. They could point out that this parameter connector $5.286,843 \times 10^{-34}$ (kgm)(m/s) / $(m_{Sgs}l_{Sgs})(l_{Sgs}/t_{Sgs})$ has no validity or meaning. Again, exactly the point.

As should be abundantly obvious by now, there is a reason why physics concocts the ratio,

h (kgm)(m/s) / {$e^2(\mu_o/\varepsilon_o)^{1/2}$ (kgm)(m/s) / ($m_{Sgs}l_{Sgs}$)(l_{Sgs}/t_{Sgs}) } = 1 / (2α) ($m_{Sgs}l_{Sgs}$)(l_{Sgs}/t_{Sgs})

numerically 6.626,076…x 10^{-34} / 9.670,562…x 10^{-36} = 1 / (2 x 7.297,353... x 10^{-3}) = 68.517,995...

The reason is the properties ε_o, μ_o, and e reveal something about the world realm of the photon. Not only do these three quantities reveal something about the world size realm of the photons, they are in fact 3 of the 4 bases necessary to set up meaningful scale systems for this realm. Repeating again as found throughout the first 4 sections of this report, anytime a quantity is divided by a bases of a scale or system it is being rescaled into that scale or system. What physics has done by this ratio h (with relative units) / {$e^2(\mu_o/\varepsilon_o)^{1/2}$ (the absolute system bases) is to rescale or resize the measured data h into a world scale relevant to itself, ie. into an absolute scale system. This is seen in Table 6.

As again should be abundantly clear by now, the value 7.297,353 x 10^{-3}, α, is NOT in fact UNITLESS, but is a meaningful quantity in a rescaled world and as such necessarily takes on the unit sizing of that world. That is, α has units, absolute units from whatever absolute system into which *h* has been rescaled.

Any confusion here lies in that in this specific context ratio, the rescaling quantity $e^2(\mu_o/\varepsilon_o)^{1/2}$ has the units of (kgm)(m/s) / ($m_{Sgs}l_{Sgs}$)(l_{Sgs}/t_{Sgs}) in the SI & Squigs measurement systems, and NOT the simpler units of (kgm)(m/s) that might occur if these three constants had been used individually for some other purpose. In this context $e^2(\mu_o/\varepsilon_o)^{1/2}$ is a parameter connector, a conversion constant from relative human SI set of scales to the absolute Squigs scales. A person may ask, why insist that the quantity $e^2(\mu_o/\varepsilon_o)^{1/2}$ is a conversion constant, rather than just a simple straight forward divisor as it apparently has been used in its historical context? Why insist that $e^2(\mu_o/\varepsilon_o)^{1/2}$ has the units (kgm)(m/s) / ($m_{Sgs}l_{Sgs}$)(l_{Sgs}/t_{Sgs}), in the SI & Squigs measurement systems, rather than as has been historically thought (kgm)(m/s)?

The answer is obvious, this choice gives meaning to α. Referring back to Chapter 3.1, Measurement Units & Scales there at least five clear reasons were given for not only insisting but for even demanding that $e^2(\mu_o/\varepsilon_o)^{1/2}$ has the units of a conversion constant as specified.

1 First discussed, in science dividing a quantity by another on the same scale was meaningless. For example; 15 apples / 5 apples is a senseless operation. The operation h (kgm)(m/s) / $e^2(\mu_o/\varepsilon_o)^{1/2}$ (kgm)(m/s) is equally senseless.
2 Secondly mentioned, simple ratios between quantities from different scales are a one point snapshot. There is no way of guessing how other values from these same scales would interact. The appearance or form of derivatives is needed to reveal this information, and derivatives have units, the units of Y / the units of X.
3 Thirdly, the concept of simple ratios between values on different scales does not even make sense if either scale is nonlinear, and here the distance scale is quadratic.
4 Fourth emphasized, was what happens if a situation is fabricated, a ratio created where, or otherwise α is declared to be unitless. Then there is no α. A physical quantity loses its sizing and its numerical value when it does not have a reference to any scale. To take the units L, T, and M away from α is like taking the unit vector references i, j, and k away from a vector. Is there anything left that is meaningful at all? Scaling is absolutely necessary to give α a context. Without definitive measurement units setting a context, then there is no distinction between α and the numerical value 44 just used above. Both are just meaningless notations.
5 Finally as just discussed, if the ratioing of h and $e^2(\mu_o/\varepsilon_o)^{1/2}$ are insisted upon as if both were still just quantities measured on relative scales, then nothing has been gained. To learn anything about the

subatomic realm discussions are needed or quantities used which are appropriately sized for that realm, ie. absolute quantities, quantities on absolute scales not relative scales.

At this point a person can attempt to argue that there is a second choice. They could point out that there are unitless ratios used in engineering, and this is what physicists intended. Such thinking here is invalid and false reasoning. The number 1 reason just given above is again confirmed. This is because this analogy offered does not hold up to the test.

Yes, engineering does in fact use dozens of unitless ratios. These are typically called Numbers, Coefficients, or Characterization parameters. For the comparator here one of the simplest and best known is used. This is the Reynolds Number which is used in the analysis of and calculations involving fluid flow. This number is the ratio of the inertial forces of a fluid system to, divided by, the viscous forces of the system. While yes since both the numerator and the denominator of this and other such typical ratios represent forces, the units from the entire expression can be "cancled". But these two forces represent different forces. They are not actually on the same scale. The Reynolds Number does not represent 15 apples / 5 apples. Instead this ratio could be thought of as 15 red apples / 5 yellow apples or 5 pieces of some other type of fruit.

The key distinction between α and the Reynolds number is that N_{Re} represents a system which is bounded or otherwise well defined. Examples would be fluid flow in a pipe or water in a ditch. This N_{Re} can also be used in referring to an object within a flowing media or stream. The properties of everything are known. The pipe wall or ditch banks have a description. The properties of relevance of the fluid are known, as also are those of any object of concern. While the Reynolds and other such numbers appear to be one point snapshots, these snapshots are just specific manifestations or actualizations of broader laws, rules, or statements of more general relationships. Any of the properties of the defined system can be changed and yet another Reynolds or other such similar characterization number can be produced for the new regime of parameters under discussion.

Such general characterization does not and can not apply to α as it has typically been used. The expression $h / e^2(\mu_o/\varepsilon_o)^{1/2}$ has no context, no boundaries, no system. Here the quantum of energy carried or represented by the photon is in the numerator. But what is this fabricated denominator? If the photon represents the system, then what is this denomenator thing, especially when this denomenator is carrying a property related to the electron? If the photon in space represents the system, then where are the boundaries? Similar such questions can be asked indefinitely. Physics has had over 100 years and has never offered an explanation, set a context, or given any meaning to this ratio. Canceling this expression's units and calling it a one point snapshot do not help this situation at all.

In a simple ratio the denominator is or sets the reference. But here this denominator is a fabricated quantity with no meaning, nor any clear reason as to why it should be mated with *h* as its numerator. In short, dividing *h* by haphazard slaped together stuff just to wipe out its measurement units is a dumb operation. Clearly the attempt to make an analogy for this ratio to the unitless expressions used throughout engineering does not hold up.

Concluding, the question can be asked where does this leave physics? This leaves subatomic physics exactly with what was intended, with the objective of this demonstration. There is now a valid scaling constant, with units, with which to scale some mathematical-geometric results related to the photon. Where does this leave physics and science with the millions of reference books showing a unitless α? The many physics reference handbook and textbooks have been good and valuable as is, up till now. But now they need to be modified slightly to reflect a broader or more accurate view of reality concerning mathematics and this quantity, α.

6 Summary

Before moving on to complete the actual successful or final demonstrations of the universality of the last two of the necessary physical constants for the leptons,

electron mass[1] / radial distance, $1.861432 \times 10^{+05}$(M relative/L absolute)
electron charge[2] / radial distance, 5.245406×10^{-03} (Q^2 relative/L absolute)

what has accomplished in this report should be listed.

1 How to construct an interlinked system of absolute physics scales has been shown. Procedures were demonstrated for using a system of such scales; how to import data into them, how to "equilibrate" data in them. What starting data is valid for use with these scales and procedures was discussed. Also discussed were many other aspects of using these scales particularly several underlying inherent features and assumptions. From these assumptions, limitations upon what could be done mathematically were seen and where procedures can go wrong when attempting to make use of these absolute scale systems.

2 The importance has been shown for the use of absolute systems of scales; those which are connected to or based on elements of the inherent structures of the particular universe of a scientific discussion. In the context of any arbitrary physics four scale grid work, the importance of importing relative numerical quantities with units, or those otherwise measured on common everyday systems of scales, into an absolute system of physics scales has been shown repeatedly. As seen this is the only means of correctly accessing the inter-parameter properties of the elementary particles.

3 The measurement system independence and universality of the photon constant $1/2\alpha$ = 68,517,994,75 (ML)(L/T) absolute has been established. As was clearly demonstrated, this constant should be reformulated or more correctly listed in reference books to have the measurement units as were found. This is because the grouping $e^2(\mu_o/\varepsilon_o)^{1/2}$ by which *h* is typically divided has the meta units (ML)(L/T) relative / (ML)(L/T) absolute or specifically for the SI metric and Squigs sets of units (kgm)(m/s) / $(m_{Sgs}l_{Sgs})(l_{Sgs}/t_{Sgs})$. In this specific case these three constants e, $\varepsilon_{o,}$ and μ_o are not just several physical constants arbitrarily sandwiched together to wipe out *h*'s units but are de-facto three of the four bases needed to create absolute physics scales. In this case they serve to import or rescale *h* with its relative scale measurement units into the realm of absolute physics measurements.

CHAPTER 3.5 ANALYSES OF MEASUREMENT SYSTEMS II

1 Introduction

This report continues the investigation of measurement systems and the work towards demonstrating the numerical universality or measurement system independence of the two conversion constants or scaled parameter connectors:

electron mass^1 / radial distance, $1.861432 \times 10^{+05}$(M relative/L absolute)
electron charge^2 / radial distance, 5.245406×10^{-03} (Q^2 relative/L absolute)

These are first pass attempts and serve the purpose of highlighting some further issues of correct ways to proceed in this and any future similar such efforts. Ultimately after having learned all the necessary correct procedural steps, the conclusion is forced that there is still something awry with the efforts here in Analyses of Measurement Systems II with respect to these two constants.

What is found is that the ultimate objective of proving the universality of these constants is valid and equally the efforts and procedures which have been used are correct. Ultimately a conclusion is reached that there is something incompatible between the human unit systems and the Samanthan unit systems as they are defined in Chapter 3.4.

2 First Procedural Attempts At How The Numerical Values Of The Lepton Charge And Mass Density Constants Might Arise

2.1 Preliminary Thoughts For The Lepton Charge And Mass Density

In the demonstrations in Table 1 which follows a means is shown of producing the constants for the electron mass^1 per radial distance (18,614...) and the electron charge^2 per radial distance (30.341...). As is seen their numerical values are as equally valid as the accepted photon constant (68.517...). The only difference is the physicists have not stumbled upon these other two constants earlier. Admittedly here are problems with these two demonstrations or first attempt procedural efforts. First, the measurement units of the ultimate numerical constants are not what are wanted. Secondly the somewhat unsavory value of 1.0 has been introduced with some relative units attached. How to avoid both of these issues are explained later.

Right now just showing that the correct numerical values are producible by strictly using the analyses of the absolute measurement systems is sufficient. This is in comparison to how these numerical values were generated in the lepton report. There both of these numerical values were derived from two entirely different and independent paths. There rigorous mathematical-geometric and calculus derivations were used.

In Analyses of Measurement Systems I, Section 2, Step 4, Table 4, how to import relative quantities into the absolute measurement systems, with two simple steps was abundantly illustrated. These two steps can be repeated several times for more complicated objectives. Once values have been imported into the same scale system these reduced values can be further combined. The repeating of steps in Table 1 here is necessitated due to the limited choice of measured or defined input data relating to the particles themselves. Valid input data for the absolute subatomic scale systems was already discussed in Analyses of Measurement Systems I Section 4. In this first attempt there is a need to input several parameter connectors in the demonstrations of the relationships between the m_e^1 and radial distance and the electron charge e^2 and radial distance. Far from being arbitrary these input parameter connectors are perfectly legitimate variants of several of the bases of the absolute grid work system. These bases are listed in Analyses of Measurement Systems I, Section 2, Step 3, Table 3.

In Analyses of Measurement Systems I, Section 5.2, Table 6, the demonstration of equilibrating real world values representing relationships, the photon or Planck constant or α which underlies h was the starting input. Since physicists accept this constant there wasn't any argument. That is, except that physicists do not appear to understand why this constant α is valid, as the result of importing a relative measured value h into an absolute scale or grid system. They have perpetually attributed α as being unitless when its validity stems from the fact that it has generic units in whatever absolute units system that is chosen. Laying aside this issue which was discussed in Analyses of Measurement Systems I, Section 5, here exploring the relationship of the electron mass to the concept of distance is nowhere near as simple.

For the three recognized leptons and their properties an analogy can be made to similar triangles. The masses of the three leptons (e, μ, τ) could be viewed as the three sides of a triangle, or the three binary ratios between these masses as the three angles of a triangle. Such a triangle can be scaled however is desired, as long as everything is scaled uniformly. Whether the values of these masses are used in the Terran system, the absolute physics Squigs scales, or in the Samanthan system of absolute Purrfect Scales doesn't matter. The only differences are simple scaling or multiplication factors. What matters is how this scalable mass triangle is related to the value of the distance units used.

This then is where the focus is needed, on the scaling relationships between the two parameters, mass of particles and distance of intelligent beings. The various available input quantities particularly in the absolute grid work need to become the focus here. This is where a roadblock is found. While physicists have measured the masses and charge of the leptons, they have not measured their sizes. Further in all likelihood, they may never be able to actually directly measure or even logically propose a consensus diameter for these particles. There is no measured input by which the size of any lepton can be related to its mass, and there may never be.

Table 1 Systems of Scales - Demonstration Of Essential Constants For Electron Properties

	Unit Combination	Samanthan Feline System (Equiv Values)	Conversions To Samanthan	Terran Human System (Input Data)	SI & Squigs Units
Electron Mass / Radial Distance					
Measure Input	M	7.163137×10^{-31}	0.786346	9.109390×10^{-31}	kg
Absolute Adj Factor	$e / (G\ \varepsilon_o)^{1/2}$	5.183259×10^{-09}		6.591572×10^{-09}	kg/m_{Sgs}
Adjusted Data		1.381975×10^{-22}		1.381975×10^{-22}	m_{Sgs}
Parameter Connector	M / L	2.252333	2.252333	1.00	kg/m
Absolute Adj Factor	$1/ (G\ \mu_o\ \varepsilon_o)$	$3.033749 \times 10^{+27}$		$1.346936 \times 10^{+27}$	rel / abs
Adj Parameter Connector		7.424258×10^{-28}		7.424258×10^{-28}	m_{Sgs}/l_{Sgs}
Combine Data and Parameter Connector		$\mathbf{1.861432 \times 10^{+05}}$		$\mathbf{1.861432 \times 10^{+05}}$	l_{Sgs}
Electron Charge² / Radial Distance					
Starting Values, Data	Coul. Def/μ_o	$8.476226 \times 10^{+06}$	$5.325795 \times 10^{+07}$	1.591549×10^{-01}	$C^2/(kgm)^{0.5}$
Absolute Adj Factor	$e/ \mu^{05.}$	7.611848×10^{-09}		1.429242×10^{-16}	rel / abs
Correlation Constant		$1.113562 \times 10^{+15}$		$1.113562 \times 10^{+15}$	$q_{Sgs}{}^2/(l_{Sgs}m_{Sgs})^{0.5}$
Conversion Constant	$(M/L)^{0.5}$	1.500778	1.500778	1.00	$(kg/m)^{0.5}$
Absolute Adj Factor	$(G^{0.5}\ \mu^{0.5}\ \varepsilon^{0.5})$	$5.507948 \times 10^{+13}$		$3.670067 \times 10^{+13}$	rel / abs
Adj Parameter Connector		2.724749×10^{-14}		2.724749×10^{-14}	$(m_{Sgs}/l_{Sgs})^{0.5}$
Combine Data and Parameter Connector		**30.34177604**		**30.34177604**	$q_{Sgs}{}^2 / l_{Sgs}$
Continue reduction to final mathematical vector curvature					
Scaled value from above			30.341776		
Quantity	$(\pi/2)^{1/2}$		1.253314		
Product			38.027777		
Reciprocal			0.026297		
Square root			**0.162162**		
Comparator	$6 / (6^2 + 1^2)$		**0.162162**		

2.2 Mathematical Or Algebraic Analysis Of Table 1 Demonstrations

As seen in Table 1 the mathematical objective can be accomplished of finding an equilibrated or system independent value exposing of the relation of the electron mass to Squigs and/or Purrfect distance units. To do this in this current procedure a unitary parameter connector is introduced as the second step of the demonstration on the Terran side of the list. There are several reasons for this.

First, the reference size of 1.0 kg/m must be introduced in this procedural effort for the reason just discussed. Physics has left no other choice, if this procedure is to be followed. There is no measured radius for comparative purposes. Having to introduce this arbitrary parameter connector may appear to be undesirable, but as discussed in Analyses of Measurement Systems I at the end of Section 4 , at times the use of such unit parameters serves a useful scaling, reference, or correlative purpose. Such an arbitrary reference, in this case with a nice 1.0 unit value, is precisely what is needed. This is because the demonstrations in the lepton report for the e^2_{rel}/l_{Sgs} of the leptons and their masses[1] versus a radial distance $m_{e\text{-}rel}/l_{Sgs}$, $m_{\mu\text{-}rel}/l_{Sgs}$, $m_{\tau\text{-}rel}/l_{Sgs}$ were in fact developed as correlations.

Secondly this parameter is introduced as the second step because in this first procedural effort the pattern of the importation process set in Analyses of Measurement Systems I, Section 2, Step 4, Table 4, is being followed too closely. What is needed here is not to mimic this Table 4 but rather consider the pattern seen in Analyses of Measurement Systems I, Section 3.3, Table 5. Later here in Section 3 this conceptual approach is followed.

Thirdly there are algebraic considerations. A reminder is needed that across this table horizontally, each row is actually an equation of the form

Y Samanthan units = (conversion constant multiplied by or divided into) X Terran units; Y = f(X) = kX

For obvious reasons the independent variable X must always be Terran input. This is because nothing is actually known about the Samanthan system, except for the relative size of the four basic common scale units.

Also the three vertical steps are equations. The first line cannot be read as Y = f(X) and then multiplied (divided) by a second line X = g(Y) and the resulting third line be expected to be meaningful.

An analogous discussion can be made concerning the exposing the relation of the electron charge squared to the concept of distance, e^2_{rel}/l_{Sgs}. What has been found in this current procedural effort is that if two or more arbitrary measurement systems are to be used, all the data needs to be introduced in the same system, the one that is of concern.

The essence of these first two demonstrations, the radial density of the electron mass and the radial density of the electron charge squared, is sixth grade algebra. An equation of the form;

Y Samanthan units = (conversion constant) • X Terran units.

where Y is the dependent variable has been used as the starting step. One side of an equation can be multiplied by anything that is useful, as long the other side of the equation is multiplied by the same thing. The right hand side of one of the equations can not be multiplied by 1.0 newton/meter and the left by 1.0 pounce/tail. Doing so would destroy the equation. Both sides could be multiplied by say 1.0 newton/meter. The units on the left side can be rearranged to look like pounce/tail, but numerically this multiplier's value is no longer 1.0.

2.3 A Few Other Notes On The Table 1 Demonstrations

As a means of starting the second demonstration or procedural efforts in Table 1 above, the one definition available in the Terran system, that of the ampere or coulomb, which relates charge to distance and mass is the necessary starting data. This was clearly shown and derived in Measurement System Bases, Section 5.2.

With the uncovering of the relationship between the lepton charge squared and the concept of distance, e^2/l_{Sgs}, this primary input is also found not to be in isolation. While it is a single value, unlike the three sizes of the lepton masses, this value is involved in three relationships which pin it down. First there is the Terran definition relating, sizing, the coulomb in terms of distance and mass. Second there is the relationship between this definition and the primary input of one of the force constants, μ_o. Thirdly the value of the charge of the leptons as measured in the common or relative system is also identical with the value of the absolute system basis for charge. In both of these two procedural demonstrations in Table 1, the primary input data already has several constraints while still in the world of the common measurement system. Further these were not arbitrary constraints. They were part of a self consistent system.

Where care is needed while using this procedure of "equilibrating" data, in an absolute system of measurement units. This is not when importing data which already has cross linkages. It is when importing data from the relative system of measurement units which is in isolation there is when care is needed. Such importation from isolation was needed as the second step of both the mass and charge demonstrations.

In Table 1 for the electron (mass/radial distance) and also for the elementary ($charge^2$/radial distance) what have been called parameter connectors were introduced. These had what would normally be the special value of 1.0 with several parameters or measurement units attached. In mathematics 1.0 is valued because it is the identity for multiplication and also the result of any number raised to the zero power. But in an absolute physics system which refers to the universe underlying the grid work placed on top of it, 1.0 units_relative is just another arbitrary number. Introducing a grouping of units to perform a necessary unit conversion might be useful, but as in the electron mass and electron charge examples these conversion constants must always be used in conjunction with other meaningful input from or about the system itself.

2.4 Logical Analysis Of The Table 1 Tabular Demonstrations

Looking carefully at the mass demonstration in Table 1 on the Terran side, there a "short cut" way to get from the final 18,614… equilibrated value back to the measured input value of the electron mass can be found. Simply multiplying by the value of the absolute or Squigs distance, $l_{Sgs} = 4.893753 \times 10^{-36}$ m in common measurement units, does the trick. This is precisely what is done in the lepton report and in the final resolution of this issue in Analyses of Measurement Systems III.

This does not work for the Samanthan side of the mass demonstration. What is needed there as is seen, is to multiply by both the absolute distance, $l_{Sam} = 1.708532 \times 10^{-36}$ t, and by the value of the parameter connector M/L which originated with relative units converted from the human side of the list. This is in fact guaranteed from the demonstrations in Analyses of Measurement Systems I, Section 3.2, Table 5.

This then is where any astute physicists should cry foul. Ignoring the algebra of Section 2.2 above and the other two "excuses" there, any opposition on their toes can proudly say at this point that exactly the opposite of what is ultimately intended has been proven. Some persons might claim that the necessary conversion constants for the lepton report are in fact measurement system dependent. These demonstrations **as constructed** or procedural efforts must begin with the Terran Human system and further must stay there.

What is needed at this point is some time out for introspection and for some further logical analyses. In Analyses of Measurement Systems I, Section 2, Step 4, Table 4, the discovery was made that for the importation/equilibration procedure to be of much use or to make algebraic sense, then the final absolute units needed to be universal conceptual meta parameters, not units specific to any one absolute system. This final value of the mass demonstration in Table 1 **as it is constructed** would not have the units of either l_{Sam} or l_{Sgs}, but rather just the units of L absolute from any and all systems simultaneously. Of course this is not to end or solve all the current problems, but is the first necessary step.

As already mentioned one of the purposes of these demonstrations or procedures **as constructed** was to produce their final numerical values for some system of measurement units, any system of units. And the only system of measurement units in which there is sufficient information, data, or parts is the Terran Human system.

Here is where these entire two demonstrations of Table 1 need to be turned on their heads, literally. These entire procedural constructions need to be invalidated. In doing so the actual validation is started for the contention that the necessary conversion factors in the lepton report are universal. This work needs to be carried over into Analyses of Measurement Systems III to be finished. But another major aspect of working with absolute measurement systems needs to be learned first.

In Analyses of Measurement Systems I Section 3.3 some warnings were given of what might occur. These demonstrations or procedures as constructed start by **assuming** that the relative to relative conversions for the particle properties are valid. This could be the first error. The relative properties, or specifically their interspecies conversions, with which these procedures started do not necessarily validate or invalidate anything. Properties of "objects" in the absolute size realm are the subject matter here. Even if referring to the absolute size realm, unit conversions there may not be valid. Ultimately, such absolute interspecies conversion factors originated with relative unit conversion factors anyhow.

First, if there are mathematical or physical laws which apply in the absolute size realm or other forms of system constraints, these override any arbitrary unit conversions. Secondly as also pointed out in Analyses of Measurement Systems I, Section 3.3, there may be mental conceptual overlays of intelligent species upon physical reality which do not in fact match the nature of the world upon which they are laid. These demonstrations do NOT prove any opponent's point. These entire demonstrations or procedures themselves are in effect invalid, because they are up-side-down.

Finally and admittedly in these Subsections 2.2 - 2.4 there has been a lot of verbiage. A person can be suspicious that something is not right with what has been done here in Table 1 in reference to what was desired. As an analogy or example of this verbal behavior, a gathering of runners immediately after the conclusion of a 100 mile ultra run can be sited. One runner asks a friend if they finished. If the friend did finish then there is the short reply, "yeh I had a good time of 27:13 (hours:minutes)". If the friend did not finish then there is 15 minutes of excuses and explanations of how and what went wrong. Finally in this failure to finish case the friend concludes with, "I have to come back next year to redeem myself". Learning what can be learned from Table 1, its approach and details might be a good idea at this time and then moving on to another try.

Exposing valuable insights in the analyses in Subsections 2.2 - 2.4 is exactly what has been done as well as the learning of how to and how not to do this new and different procedure. Such material concerning the practical use and application of absolute physics scale systems cannot be found in textbooks. So trial and error and analyses has been used here.

3 Second Pass Attempts Or Demonstrations Of The Constants' Universality

3.1 Pictorial Demonstrations Of A Second Approach To The Constants

A totally different viewpoint from which to start the mathematics is needed. Next the viewpoints and procedures as seen in Figures 2.1 and 2.2 are tried. These figures illustrate a second "slightly better" view of how to deal with the current situation.

Beginning at the beginning. <u>The law or rule which specifies the underlying reality of the wave forms of the subatomic realm which are of concern is the necessary starting place. The parameter connecting constant is the required starting input.</u> This relates the world as the particles experience it, mass and charge, with the world as humans understand it, time and space or distance. Like sixth grade algebra for resolving expressions with parenthesis, the inside is the starting point and the work is outwards. Starting from the outside and working inwards, is again an attempt by humans to impose their will on the system or structure of discussion. Such attempts just up over constraining the system. This is exactly what occurred in the demonstrations in Table 1 just discussed. An attempt was made to start with the result of the model, the particle masses and charge, and then to work inwards towards the underlying rule or relationship. As found this resulted with a mathematically undesirable or incompatible situation. One flaw with this previous procedural approach was that the electron's mass and charge in the two distinct measurement systems were not available from which to start. There was just an assumption or idea that these data were available.

So looking at Figure 2.1, the beginning is in the middle with the universal or unitwise generic statement of the parameter connector or rule, 1.8614 x 10^{+05} mass relative per distance absolute. Then the work is outwards, multiplying by the absolute unit of length in whatever measurement system of concern. For this approach, this produces a mathematically and unitwise correct electron mass in relative units. This second viewpoint or procedural technique already shows that the original relative-to-relative interspecies unit conversions for masses did not apply to this absolute size realm. From this procedure's viewpoint the very first operation in the first demonstration in Table 1 was invalid, and all the side-by-side operations from there on down were of no benefit. The correct relative-to-relative interspecies unit conversion for particle masses is determined or driven by the rule or parameter connecting constant, not the other way around. Without first seeing the proper relationships as shown in Figure 2.1, a very curious or counter intuitive relationship results. From the second viewpoint seen here, the correct inter-measurement system relative mass relationship for the electron begins with the ratio of the measurement systems' absolute units of length, not the ratio of their units of mass. For the measurement systems here of course all the relative-to-relative unit ratios are numerically their same as their individual absolute-to-absolute ones.

Once the numerical value has been obtained for the relative mass of the electron in whatever measurement system the next steps are easy to follow thru. Multiplications are then done by the individual measurement system's relative-to-absolute mass conversions. The final across system or interspecies absolute mass ratio for the electron are nothing at all related to the original assumptions given in Analyses of Measurement Systems I, Section 2 and shown there in Table 2.2.

Now having seen how Figure 2.1 is set up, then working thru Figure 2.2 is essentially identical. Again from the view of this second approach here or procedural technique the result is that the original unit conversion factors for the relative-to-relative and absolute-to absolute quantities related to the particles as listed in Analyses of Measurement Systems I, were invalid first working assumptions. Specifically in the case of Figure 2.2, the elementary charge of the electron is now the point of this concern.

At this point a person can ask what assurances are there that these key center piece parameter connectors have the numerical values and generic units have been shown. This is a very legitimate and valid question. To answer, first the numerical value for the charge^2 / radial distance, e^2_{rel}/L_absolute, was derived previously in the lepton report from vector geometric derivative considerations. Likewise also in the lepton report the value for the mass^1 / radial distance, $m_{e\text{-}rel}$/L_absolute, was derived from scalar geometric integral considerations. In the lepton report these various derivative and integral expressions and formulas involved were first found. Having seen these there, then an entire other analysis was necessary to see how these measurement units can arise. This discussion may be given in the appendices as Arisal of Measurement Units.

Finally as to why mass is to the first power while charge is a squared quantity, this cannot be definitively proven. So speculations on these matters were grouped, along with that of the quantity of color being a cubed parameter in Part 2, with the more speculative or conceptual reports. Elsewhere in Part 2 other more speculative matters were delved into for which there are no hard mathematical or geometric backing, such as thoughts on the nature of the mathematical-geometric forms of the mass of the quarks.

Without going too far afield, some interesting trends or patterns can be seen that are relevant to the work here with these key parameter connectors. These were also called mathematical-geometric constants, with measurement units in the lepton, photon and ternary force interaction constant reports. First the quantity related to the particle, the electron, is in the numerator position and is scaled by the quantity understood by large scale intelligent beings which is in the denominator. This denominator is the reference or basis and the particles inherent property are being translated or imported into the human's world realm.

FIGURE 2.1

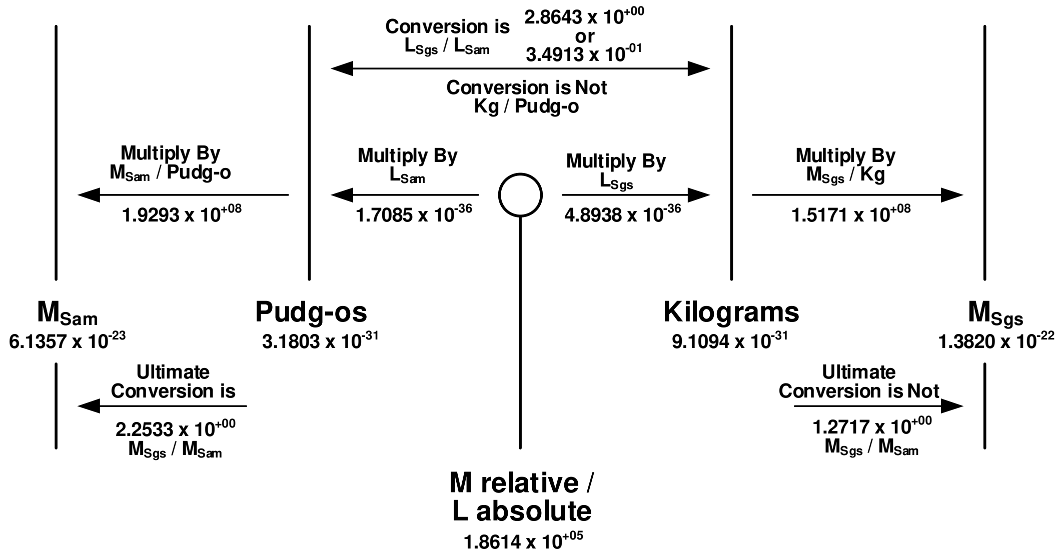
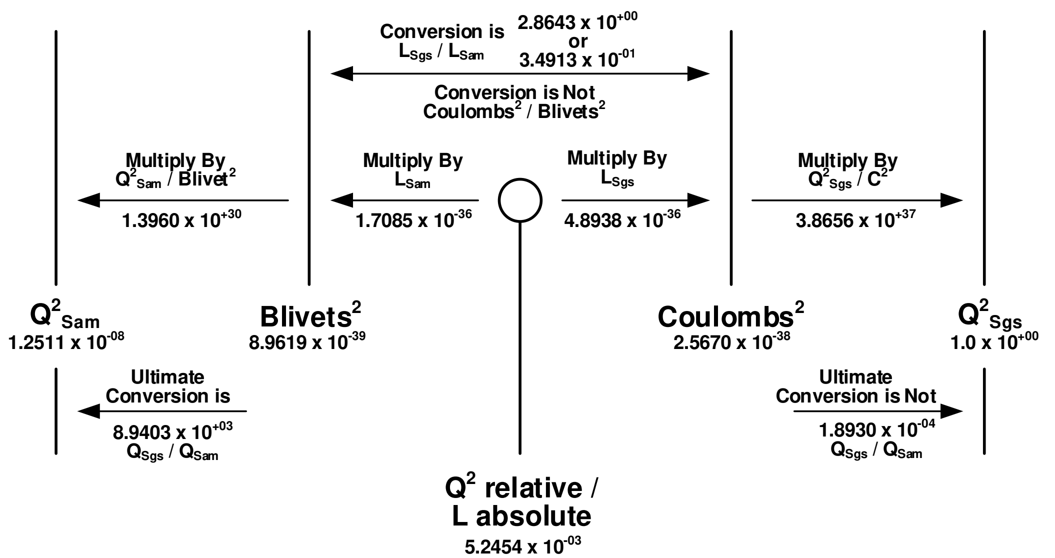


FIGURE 2.2



Likewise the particle's property, mass or charge, are being imported into the measurement system of relevance to the humans, but which is of course only a relative sense of measurement for the particle. Inversely for the denominator of these expressions, the human or Samanthan experience must be related or sized to the world realm of the particle. That is; for the denominator scales are used which are absolute to the electron's sense. To be fair, a correlation constant doesn't serve its essential function, unless it is set up in this manner.

3.2 Repeating For American Industrial Units

At this point, again, any scientist or engineer on their toes might say wait a minute. The implications of what has been dome in Section 2.1 and Table 1 and said in Section 3.1 and Figure 2.1 and 2.2 are not correct. Returning to the two measurement systems of the gas law demonstration, the implications of the results of the procedural technique used here would be that the simple relative unit conversions between American Industrial, AI, units and the SI metric units cannot be used to build the following equation.

Electron mass (American Industrial units 2.9886×10^{-30} lb) = 2.2046 lb/kg x electron mass (SI metric unit 9.1094×10^{-31} kg)

There are several major and critical differences between these sets of systems. Here all four of the relative and absolute scales in the systems L, T, M, and Q were completely independent from their counterparts in the other system. They were related by random numbers. For the AI and SI set of units used in the gas law demonstration two of the scales are identical. Time T is seconds in both systems, and the quantity of charge Q is coulombs in both systems. Only distance L and mass M have different scales.

Letting the relative-to-relative conversions for the mass of the electron between the AI and SI set of units fall where they may, then identical situations are found on the first line of the demonstrations in Analyses of Measurement Systems I, Section 3.2, Table 5, and here in Section 2.1, Table 1. Then results or conclusions similar to Table 5 there and Table 1 here are inescapable. For mixed relative numerator to absolute denominator parameter connectors there is only one correct algebraic operation to obtain numerically equalized or scaled values. Multiplication by the following factor must occur somewhere.

Property of ratio's denominator (relative system 2 / relative system 1)
Divided by
Property of the ratio's numerator (absolute system 2 / absolute system 1)

Likewise when starting with the statement of a law or rule with a mixed relative numerator to absolute denominator set of units, then the necessary steps analogous to those shown in Figures 2.1 and 2.2 to get back to the physical property are indisputable. As is said in text books, the reader can go thru this exercise between AI and SI units.

The key here is that the numerical value of the proposed law or rule must be mathematically independent from this whole business of units, either relative or absolute, at least initially. The numerical value must be built from or based on mathematical and geometric principles. Then thru the use of initial distributions, boundary conditions, or other such considerations generic, universal, or conceptual meta units are attached. This may be discussed in the appendices as Arisal of Measurement Units to be added to the Appendices later..

4 Break Time

At this point a break is needed from the mathematical procedural efforts. After these multiple attempts something is still clearly unsatisfactory. These efforts are close to producing the desired results. All the points that have been brought up about the nature of what needs to be done, such as starting from the inside and working outwards, are valid. The nature of the various measurement systems, particularly the absolute ones which have been discussed in both Analyses of Measurement Systems I & II needed thorough exploration. In fact without these difficulties much of the procedural material discovered would not have been brought to light. Never-the-less, the bottom line as to what is going awry with these efforts to show the universality of several physical-mathematical constants has not yet been exposed.

These discussions and demonstrations need to be continued in Analyses of Measurement Systems III. What is found is that the critical viewpoints discovered in these last two reports, approachs tried, and procedural efforts have been valid and correct. Likewise the objective starting mathematical, geometric, calculus constants used in the lepton report and their conceptual model are completely correct. To refresh the reader's memory, these two conversion constants or scaled parameter connectors are repeated here:

electron mass^{1} / radial distance, $1.861432 \times 10^{+05}$(M relative/L absolute)
electron charge^{2} / radial distance, 5.245406×10^{-03} (Q^2 relative/L absolute)

Where the problem lies is with the incompatibility of the two measurement systems used throughout these last two reports. The SI metric set of units is NOT in fact what has been claimed in these two reports, Analyses of Measurement Systems I & II. The SI metric set of units does not have 4 independent scale bases. Yet at the same time this property of independent was ascribed to 3 of the 4 relative scales of the Samanthan system of units.

This issue concerning the SI set of scales was thoroughly discussed in Measurement Systems Bases. The two quantities "understood" or experienced by humans, distance-length and duration-time do have completely arbitrary bases. But the severe difficulty in the efforts here results from the human definitional geometric stories which have been imposed upon the two parameters, mass and charge, experienced by the particles or wave forms. These effectively link these two parameters as dependent variables, not independent bases.

Dropping all the way back to the beginning of the procedural efforts of these last two reports reveals the core of difficulties which have arisen here. The SI relative set of units, which underlies the Squigs absolute set of scales, effectively or functionally only has 2 independent bases. The Samanthan Feline relative measurement system, which underlies the Samanthan Purrfect absolute set of scales, has 3 independent bases. Both of these representations for the world realm of the particles cannot simoultaneously be true. In short at least one of these sets of absolute measurements scales in fact does not meet the definition of having absolute scales, since one or both of these sets of scales do not correctly reveal or mirror the structural nature of the topic of discussion.

Having regained this critical perspective, the original objectives can be quickly and easily accomplished. In Analyses of Measurement Systems III the independence from measurement systems of the two constants necessary for the lepton report are finally be demonstrated, or even definitively PROVEN.

CHAPTER 3.6 ANALYSES OF MEASUREMENT SYSTEMS III

1 Introduction

This report continues the investigation or analyses of measurement systems. Different categories of measurement systems are examined to see how they affect the particle physics research of this work. This report also highlights the ultimate broader applicability of this work to the mathematical physics of other intelligent species.

In Analyses of Measurement Systems I, side-by-side sets of relative and absolute scale or measurement systems were developed. These systems were thoroughly examined and much was learned about their nature and correct and incorrect usages. The relatively simple demonstration of the numerical universality or measurement system independence of the photon constant 1 / (2α) = 68,517,994,75 (ML)(L/T)_absolute was given there. This constant for the photon was clearly and unequivocally demonstrated to carry the absolute conceptual or meta units (ML)(L/T).

In Analyses of Measurement Systems II, few final critical insights were learned about how to approach two of the necessary parameter connectors, mathematical-geometric constants which were developed in the lepton report. But regardless of how the procedural efforts were changed or the view of working with these two constants

electron mass[1] / radial distance, $1.861432 \times 10^{+05}$(M relative/L absolute)
electron charge[2] / radial distance, 5.245406×10^{-03} (Q^2 relative/L absolute)

their independence from specific measurement systems could not be demonstrated satisfactorily. That is to the extent and in the manner as would be liked by any engineer or scientist. Ultimately a reexamination of the entire analytical setup and the assumptions underlying the demonstrations was needed.

What is found in this report is:

1 The numerical values of the two physical constants above ($M_{e\text{-}rel}$ / L_{abs} and $Q^2_{e\text{-}rel}$ / L_{abs}) with their specified units are indisputably valid for any specific category of measurement systems.
2 The algebraic approaches and the material learned in Analyses of Measurement Systems I & II are likewise valid and valuable.
3 The failure of the efforts in System Analysis II lies with the comparator measurement system which was being used, not with the objectives nor the approaches.
4 As hinted at in Measurement Systems Bases, Section 3.4, and in Analyses of Measurement Systems II, the problems stemmed from the measurement systems. These had behind the scenes conceptual stories that were discussed at length in Measurement Systems Bases. By their choices of measurement systems, intelligent beings had overlaid various conceptual narratives upon physical reality. Further as is seen in this report very shortly, different measurement systems contain different stories so as to make some of them incompatible with each other and with this work.

2 Interactions Between Measurement Systems

2.1 Measurement Systems Categories

What was found in Measurement Systems Bases was that not all measurement systems are created equal. This was the difficulty in System Analysis II. No matter how valiant the efforts, the universality of the necessary mathematical-geometric constants could not be demonstrated. This difficulty did not stem from the objective of this work. The problem was values were being transferred across measurement systems which were not equivalent or analogous. The Samanthans were chasing the tailless humans.

Some distinctions between various measurement systems are needed from a view that resolves these difficulties. While there can be many different categories of measurement systems, only two are the focus here; sets of measurement units analogous to SI metric units and sets of measurement units with random or independent bases. Some definitions are needed.

Category: SI metric unit set analogous

From Measurement Systems Bases the following underpinnings of the SI metric set of units were found.

1 The base relative unit of mass, M, has a 1:1 correspondence with base relative unit of length, L. Mass can be $\propto L^1$, L^2, L^3, or L^n according to the number of dimensions of the mass expression being described.

2 The base relative unit of charge, Q, has a 1:1 correspondence with the base relative unit of length, L such that $Q \propto L^{1/2}$.

From the SI set of relative measurement units the following are used; L meter, T second, M kilogram, Q coulomb.

For the corresponding set of absolute measurement units the physics Squigs scales are used. These were already discussed in Measurement System Bases and Analyses of Measurement Systems I & II.

For a second set of SI analogous relative units, a fictitious Binks Feline System is fabricated with; L paw, T live, M crunchy, Q widget.

For the corresponding set of absolute units the Binks Furry System is created as defined below.

Category: Random or Independent Measurement Set

The 4 relative measurement bases of concern; L, T, M, & Q are essentially random, independent, and have no interlinkages.

For the first relative set of such random parameters the American Industrial units is used with; L feet, T minute, M pound, Q coulomb. This system is labeled the AI system of units.

For the corresponding absolute counterpart system, the US Dummy units has been imagined as defined below.

The other set of independently based scales has already seen, the relative Samanthan Feline System as used in Analyses of Measurement Systems I & II; L tail, T nap, M pudg-o, Q blivet.

This system's absolute counterpart is the Samanthan Purrfect System of units.

2.2 Measurement System Comparisons

Starting with these two categories of measurement systems there can now be 4 classes of interactions between them.

Originating Unit System	Comparator Unit System
metric analogous	metric analogous
metric analogous	independent bases
independent bases	metric analogous
independent bases	independent bases

2.3 Definitions And Setup Of Comparison Cases

The measurement systems shown in Table 1 are built as following:

The Samanthan Feline System of relative units: As originated in Analyses of Measurement Systems I, the ratios of this system's units of measure L distance-length, T duration-time, and M mass to the corresponding Terran SI set of parameters are random numbers. The Samanthan value of charge is set up so that when its numerical value is squared, then it numerically equals the value of the electron's mass in that system. This last specification as it turns out is of no irrelevant to this work.

The Terran American Industrial set of relative units: As is well known the inter-relationships between L, T, M, Q within the AI units are essentially random or the measurement scales are completely independent. The smallest AI unit of time is of course equal to that of the SI set of units, the second. Except here the minute is intentionally used, a factor of 60 times larger. Likewise the AI base unit for Q is identical with that of the SI set of units, the coulomb.

The Binks Feline System of relative units: The Binks unit of length, the paw = 1/16 the Samanthan tail. The Binks unit of time, the live = 9^4 Samanthan naps. The Binks unit of mass, the crunchy, is numerically equal to that of its length, the paw. The Binks units of M and L have the same linkage as between M and L for the Terran SI set of units. Finally the Binks unit of charge Q, the widget numerically = $L^{1/2}$. This Q and L linkage in the Binks Feline System is the same linkage as for the ultimate Terran SI definition of the unit of charge, the coulomb. By the specifications in Section 2.1 above, the Binks system of units is analogous to that of the SI set of units.

The absolute sets of units: The bases for the Squigs units were thoroughly discussed in Measurement Systems Bases. The Samanthan Purrfect units, the US Dummy units, and the Binks Furry units are all set up completely analogous to the Terran Squigs units. An in depth numerical analysis of both the Squigs and Purrfect units is given in Analyses of Measurement Systems I.

A simplistic way in which to proceed and the details or data of the specific comparison cases need to be set up. Table 1 lists all the relevant data and unit conversions that are needed. The entire table is based off or ratio/proportioned to 1.0 units of the appropriate relative metric parameter or parameter combinations.

Table 1 Measurement Systems For Comparison

	Metric Analogous		Independent Bases	
Relative Units	Terran SI System	Binks Feline System	Terran AI System	Samanthan Feline System
Distance-Length, L	1.0	5.586,002	3.280,839	0.349,125
Duration-Time, T	1.0	1.352,888 x 10^{-04}	0.016,666	0.887,630
Mass, M	1.0	5.586,002	2.204,622	0.786,346
Charge, Q	1.0	2.363,472	1.0	5.282,519 x 10^{+03}
Physical Properties				
Electron Mass, m_e	9.109,390 x 10^{-31}	5.088,507 x 10^{-30}	2.008,287 x 10^{-30}	7.163,137 x 10^{-31}
Elementary Charge, Q	1.602,177 x 10^{-19}	3.786,702 x 10^{-19}	1.602,177 x 10^{-19}	8.463,532 x 10^{-16}
Photon Constant (ML)(L/T)_relative	6.626,076 x 10^{-34}	8.536,853 x 10^{-28}	9.434,349 x 10^{-31}	7.154,850 x 10^{-35}
Universal Constants				
G Gravitational Constant $(L/M) \times (L/T)^2$	6.672,590 x 10^{-11}	1.137,566 x 10^{-01}	3.847,846 x 10^{-06}	4.583,104 x 10^{-12}
ε_o Electric Constant $Q^2/(ML) \times (L/T)^{-2}$	8.854,188 x 10^{-12}	9.297,566 x 10^{-22}	3.159,052 x 10^{-17}	5.817,517 x 10^{-03}
μ_o Magnetic Constant $(M/Q^2) \times (L/T^0)$	1.256,637 x 10^{-06}	7.019,577 x 10^{-06}	9.089,273 x 10^{-06}	1.236,297 x 10^{-14}
Absolute Units (1.0 Abs Units = n Rel Units)	Terran Squigs Units	Binks Furry Units	US Dummy Units	Samanthan Purrfect Units
Distance-Length, L	4.893,753 x 10^{-36}	2.733,651 x 10^{-35}	1.605,561 x 10^{-35}	1.708,532 x 10^{-36}
Duration-Time, T	1.632,380 x 10^{-44}	2.208,428 x 10^{-48}	2.720,633 x 10^{-46}	1.448,950 x 10^{-44}
Mass, M	6.591,572 x 10^{-09}	3.682,053 x 10^{-08}	1.453,192 x 10^{-08}	5.183,259 x 10^{-09}
Charge, Q	1.602,177 x 10^{-19}	3.786,702 x 10^{-19}	1.602,177 x 10^{-19}	8.463,531 x 10^{-16}

3 Measurement System Comparison Operations

The measurement system comparison operations are simple in this report, four easy steps.

1 The two key mathematical-geometric constants, with universal meta units, are the starting inputs in all the systems of comparison. These constants are:

electron mass[1] / radial distance, 1.861,431,80 x 10^{+05} ($M_{relative} / L_{absolute}$)
electron charge[2] / radial distance, 5.245,406,17 x 10^{-03} ($Q^2_{relative} / L_{absolute}$)

These constants describe the mass-to-distance and charge^2-to-distance of the electron respectively and are developed in the lepton report. Here all that needs to be shown is the universal applicability of their measurement units.

2 These inputs are multiplied by the appropriate measurement system's value of $L_{absolute}$.

3 The originating system's relative values of the electron's mass and charge are converted to those of the comparator system by the appropriate relative-to-relative conversion factors. Incidentally, these conversion factors are also equivalent to absolute-to-absolute conversion factors.

4 The resulting values of Steps 2 & 3 are checked to see if they are consistent.

5 Also the value resulting from Step 3 is used as a start, Step 2 reversed, and the result checked to see if the correct originating mathematical-geometric constant is obtained.

Two principles learned the hard way in Analyses of Measurement Systems I & II are used here. The law, rule, mathematical-geometric constant, or parameter connector is to be the originating input data and then the physical application or measured property is worked towards. This is similar to solving a grade school algebraic equation by starting with the inner most parentheses and working outwards. This necessity of this was learned in Analyses of Measurement Systems II. Additionally this initial parameter connector is viewed as having universal, meta, generic parameter, or place holder units. This necessity was learned in Analyses of Measurement Systems I, Section 3.

4 Results Of Cross Measurement Systems Comparisons

The results of these cross measurement system analysis are listed in Tables 2 and 3 below. As seen there are a variety of outcomes.

Again these initiating physical constants found in both Tables 2 and 3 have universal conceptual or meta units. These constants are applicable to all systems simultaneously and do not need any numerical conversions between the various systems.

Table 2 Results Of Measurement Systems Comparisons -- SI Analogous Bases

Analysis Originator System Is SI Analogous			
	Analysis Originator	Analysis Comparator	
	Terran SI & Squigs Systems	Binks Feline & Furry Systems	Samanthan Feline & Purrfect Systems
Physical Constant M_{rel} / L_{abs}	**$1.861,432,180 \times 10^{+05}$**	**$1.861,432,180 \times 10^{+05}$**	**$1.861,432,180 \times 10^{+05}$**
System $L_{absolute}$	$4.893,753,842 \times 10^{-36}$	$2.733,651,880 \times 10^{-35}$	$1.708,532,425 \times 10^{-36}$
Product = Calculated m_e, relative units	$9.109,389,021 \times 10^{-31}$	$5.088,507,578 \times 10^{-30}$	$3.180,317,236 \times 10^{-31}$
Expected m_e relative units of M	$9.109,389,7 \times 10^{-31}$	$5.088,507,958 \times 10^{-30}$	$7.163,136,783 \times 10^{-31}$
Inverse Operation → Calc Phys Const	$1.861,432,319 \times 10^{+05}$	$1.861,432,319 \times 10^{+05}$	$4.192,567,070 \times 10^{+05}$
Physical Constant Q^2_{rel} / L_{abs}	**$5.245,406,17 \times 10^{-03}$**	**$5.245,406,17 \times 10^{-03}$**	**$5.245,406,17 \times 10^{-03}$**
System $L_{absolute}$	$4.893,753,842 \times 10^{-36}$	$2.733,651,880 \times 10^{-35}$	$1.708,532,425 \times 10^{-36}$
√Product = Calculated Q_e, relative units	$1.602,177,311 \times 10^{-19}$	$3.786,702,317 \times 10^{-20}$	$9.466,755,793 \times 10^{-20}$
Expected Q_e relative units of Q	$1.602,177,330 \times 10^{-19}$	$3.786,702,362 \times 10^{-19}$	$8.463,531,637 \times 10^{-16}$
Inverse Operation → Calc Phys Const	$5.245,406,296 \times 10^{-03}$	$5.245,406,296 \times 10^{-03}$	$4.192,567,066 \times 10^{+05}$

First in Table 2, the originator of the cross system analysis is SI analogous. This originator is in fact the SI set of relative units and their derived counterpart the absolute physics Squigs units. First and foremost as is seen these sets of units do themselves produce the desired results. That is; when starting with the appropriate specified mathematical-geometrically derived constants, then the numerical values of the electron mass and electron charge with their relative SI units are correctly produced. These starting property constants or laws are of course a result of the calculus work in the lepton report. Likewise, the inverted algebra correctly reproduces these physical constants.

What is found in the middle column is that the Binks systems of relative and absolute units also correctly produce the desired physical properties with their relative units for those systems. **This then has been the objective of all of the efforts of Analyses of Measurement Systems I - III. Now the mathematical-geometric constants, the results of lepton report, can definitively be said to be numerically universal or measurement system independent. That is, with the one constraint that the system under consideration must be SI analogous.**

A reminder is made that the two key unit definitional inputs to this Binks system, L and T, are scaled versions of the random numbers from the Samanthan system. What is also interesting is that these two parameters represent the two conceptual quantities of intelligent beings. Whereas the two parameters related to the natural world had the constraints as listed above in Sections 2.1 and 2.3.

In the right hand column with the purely random Samanthan set of relative and absolute scales there are many problems. Nothing is correctly reproduced. This was already seen abundantly in Analyses of Measurement Systems II. The only way to obtain either the desired physical properties or the intended physical law, the parameter connector, involved dragging further inputs and conversion constants between the originator and comparator systems. As noted in Analyses of Measurement Systems II there was an unsatisfactory feeling about this necessity. Further seen in Analyses of Measurement Systems I the necessity of this extra algebra was guaranteed. The outcome of the simple algebra of these mixed measurement expressions with relative units ratioed by absolute units could not be avoided.

Next in Table 3, the American Industrial set of units are the originator for the cross system analysis. As is well known, the measurement scales in this system are completely random or are an independent mess. These units were originally historically related to the height of the king's horse, the length of his nose, or some other equally ludicrous impermanent political "standard". What is found is that this originator system and its derived fictitious absolute physics system, the US Dummy system, just like the Samanthan systems do not serve any useful function in subatomic physics work.

First starting with the logical straight forwards relative-to relative conversion factors for mass-to-mass and charge-to-charge between the three systems. Some expected values for the electron mass and charge are obtained in each Binks SI analogous system. Then as is seen in the either the middle or right hand columns of algebraic steps, none reproduce these electron mass values nor its charge as would be expected from these straight forwards relative-to-relative conversions. Again the algebra of the expressions' units guarantees this undesirable outcome.

One benefit is found from using these wacky US measurement systems as the originators of this analysis. This is seen in the middle column in Table 3. What is found is something very interesting with the reverse algebra. When working backwards, surprisingly a numerically identical value is obtained in both the originator and comparator Binks SI analogous systems for an expected value of what the physical constant would or should be. This is of course not the correct value, but the fact that it is

Table 3 Results Of Measurement Systems Comparisons – Independent System Bases

Analysis Originator System Has Independent System Bases			
	Analysis Originator	Analysis Comparator	
	Terran AI & US Dummy Systems	Binks Feline & Furry Systems	Samanthan Feline & Purrfect Systems
Physical Constant M_{rel} / L_{abs}	**$1.861,432,180 \times 10^{+05}$**	**$1.861,432,180 \times 10^{+05}$**	**$1.861,432,180 \times 10^{+05}$**
System $L_{absolute}$	$1.605,561,956 \times 10^{-35}$	$2.733,651,880 \times 10^{-35}$	$1.708,532,425 \times 10^{-36}$
Product = Calculated m_e, relative units	$2.988,644,692 \times 10^{-30}$	$5.088,507,578 \times 10^{-30}$	$3.180,317,236 \times 10^{-31}$
Expected m_e relative units of M	$2.008,276,660 \times 10^{-30}$	$3.419,319,477 \times 10^{-30}$	$7.163,136,783 \times 10^{-31}$
Inverse Operation → Calc Phys Const	$1.250,824,768 \times 10^{+05}$	$1.250,824,768 \times 10^{+05}$	$4.192,567,070 \times 10^{+05}$
Physical Constant Q^2_{rel} / L_{abs}	**$5.245,406,17 \times 10^{-03}$**	**$5.245,406,17 \times 10^{-03}$**	**$5.245,406,17 \times 10^{-03}$**
System $L_{absolute}$	$1.605,561,956 \times 10^{-35}$	$2.733,651,880 \times 10^{-35}$	$1.708,532,425 \times 10^{-36}$
√Product = Calculated Q_e, relative units	$2.902,038,006 \times 10^{-19}$	$3.786,702,317 \times 10^{-19}$	$9.466,755,793 \times 10^{-20}$
Expected Q_e relative units of Q	$1.602,177,330 \times 10^{-19}$	$2.090,588,957 \times 10^{-19}$	$8.463,531,637 \times 10^{-16}$
Inverse Operation → Calc Phys Const	$1.598,799,839 \times 10^{-03}$	$1.598,799,839 \times 10^{-03}$	$4.192,567,066 \times 10^{+05}$

identical reveals that all is not lost. The SI analogous Binks Feline and Furry systems have done something amazing, even when they are being compared with a random mess of originating AI and Dummy measurement scales. This reveals something beneficial about the nature of this SI analogous system.

In the right hand column with the Samantha compraitors, nothing is found to have changed from Table 2 above. The results of comparing a measurement or scale system with independent bases, the Samanthan systems, against either an SI analogous systems, the Terran SI and Squigs systems in Table 2, or equally against a randomly based systems, the Terran AI and Dummy systems in Table 3, are somewhat surprisingly identical. This again is actually beneficial information. This indicates that the results to be found from these simple three step procedure are related to the independently based set of comparator scales, the Samantha systems, and are not related to the nature of the originating scales.

4.1 Summarizing The Outcomes Of Measurement Systems Cross Comparisons

The work in Analyses of Measurement Systems II demonstrated that there could be several different classes of outcomes when comparing or transferring numerical values, with units, between measurement systems. That is, when mapping values between complete systems containing both relative or measured data and absolute geometric constants, laws or rules, different categories of results can be produced. In Analyses of Measurement Systems II this was a source of frustration because the cause of the various and often undesirable outcomes was not yet known. In this report just what these outcomes are has been clarified and also which systems produce what.

The classes of outcomes which are found in Tables 2 & 3 are be summarized here with-respect-to the outcome of transferring the electron mass values between the systems. This is when beginning with a specified mathematical-geometric constant for (relative mass / absolute distance). The same outcomes were found when the electron charge squared is mapped between the various measurement systems.

Desired Outcome:

This outcome occurs where both the originator and comparitor systems are SI analogous.

The relative mass in the comparator system is replicated as would be expected from straight forwards relative mass – to – relative mass conversion constant. This is if the universally correctly specified mathematical-geometric constant is the starting or input value.

Additionally the numerical value of the mathematical-geometric constant for (relative mass / absolute distance) is correctly reproduced when the relative masses are the starting or input values.

Partially Desirable:

This outcome occurs where the originating systems are randomly based and only the comparator systems are SI analogous.

The relative mass in the comparator system is not replicated as would be expected from straight forwards relative mass – to – relative mass conversion constant.

An identical numerical value of a mathematical-geometric constant for (relative mass / absolute distance) is produced, but this is not the desired or universally applicable value.

Worst Case: nothing is reproduced correctly

This outcome occurs where both the originating systems and the comparator systems have independently based scales.

The relative mass in the comparator system is not replicated as would be expected from straight forwards relative mass – to – relative mass conversion constant

The numerical value of the mathematical-geometric constant for (relative mass / absolute distance) is not reproduced, nor are the values produced by the originator and comparator systems even identical.

5 Thoughts On What Has Occurred

The intended outcomes of this and Analyses of Measurement Systems I & II have been demonstrated, proven. These outcomes are that mathematical-geometric physical constants with units are universal or measurement system independent. These outcomes occurred within a specific category of measurement systems, SI analogous. Now consideration as to why this has occurred or what is leading to this result are in order.

There are several choices, at least;

1 The arbitrariness of SI analogous measurement systems coincidentally and accidentally matches the inherent nature of the particles and wave forms of the subatomic size and duration realm.

2 The arbitrariness of SI analogous measurement systems coincidentally and accidentally matches the mathematics and geometry which are found in the mathematical-calculus analysis of the leptons.

3 All three, the SI analogous measurement systems, the real physical world, and the mathematical-geometric analysis line up. That is, this category of system of measurement units and the mathematical efforts both correctly model physical reality.

A reminder is again needed that the world size realm of George Johnstone Stoney and the particles is at a scale 36 orders of magnitude smaller in distance than humans and 44 orders of magnitude smaller than the human invented second, and the electron 33 orders of magnitude smaller in mass than a human. And futher the little critters of investigation are really only just wave forms or energy bodies and do not really have any "solid" form.

After a short consideration, choice 3 is can be concluded to be the correct choice. This conclusion is bolstered by Table 3 above. There the SI analogous set of units, the Binks Feline and Furry systems, reproduces whatever the value is of the physical constant as was produced by the originating system of measurement units. The physical constant which was originated there is just not correct. It appears that the only problem in this cross system comparison is the originating system of measurement units is not a good model of physical reality or of the mathematics of this work.

This reconfirms an obvious point of this entire body of work. The subatomic particles do have forms, wave forms, and these structures give rise to their physical properties as observed externally by humans. That is specifically, the physical properties of leptons and photons are not the result of some arbitrary roll of the dice. Further as seen here, coincidentally or otherwise, SI analogous based relative and absolute measurement systems appear to correctly model the inherent nature of these particle forms.

In Measurement Units & Scales and Measurement Systems Bases an obvious reality concerning measurement systems was discussed. This is that a measurement system is a somewhat arbitrary model which is being imposed upon that which is being measured. In Measurement Systems Bases, Section 8, the concern was repeatedly raised that dynamically based measurement scales clearly impose definitional geometries and intellectual conceptual narratives upon the topic, phenomena, and "objects" which are to be subjected to a particular measurement scale. This concern specifically focused upon the two measured parameters, mass and charge, which describe properties that are inherent to matter. Since these properties are the result of internal or inherent features of independent entities, then humans or other intellectual species cannot validly impose their own home grown conceptual stories upon them. The validity of this concern is again bolstered by Table 3 above. There the arbitrary Samantha Feline and Purrfect, relative and absolute, systems of measurement were found to be incapable of correctly reflecting subatomic physical laws and properties. The only values that these systems could consistently reproduce were their own silliness. In short, these arbitrary measurement systems were not good models for certain subatomic physical phenomena.

Considering the implications of Tables 2 & 3, had these been known ahead of time, then much of the effort in Analyses of Measurement Systems I & II could have been avoided. Each relative measurement system discussed in this overall work has 4 bases of concern; L, T, M, & Q. Reviewing Section 2.1 above, there two distinct broad categories of measurement systems were defined. These two categories were set up according to if and how certain of their parametric bases were cross linked to others in the same measurement set. Many more categories could have been offered for discussion. Considering the combinations of 4 bases where any from 0, 1, 2, 3, to all 4 are cross linked, then the tables which would have been needed here in this report would have gotten out-of-hand. But all that is needed is to remember the definition of an absolute measurement unit or set of such units. Absolute measurement units reveal, reflect, or expose the nature the structure of the realm of discussion. If one category of measurement units performs this function by correctly or accurately modeling the subject of discussion, then this category can truly be called absolute. This then excludes all the other categories from actually being absolute and they should not be referred to by that descriptor. Using this logic and knowing that the SI analogous category of relative and absolute measurement units correctly modeled the structure of the leptons would have saved a lot of work.

To broaden this discussion every so briefly the discussions in the Appendix 2, Time & Space might be considered. There speculative discussions are made about the nature and spatial dimensionalities of mass-gravity, charge-electromagnetism, and white-color. To restate these discussions in very short form, the proposal was made that mass is a one dimensional encapsulated or standing wave of the gravitational force. Likewise charge has an inherent two dimensional nature or is inherently a squared phenomenon. These spatial dimensionalities just happen to match with the conceptual origins of the SI set of units, with mass being 1:1 with a unit of $length^n$ and charge being $\propto length^{1/2}$. This is agreement with the physical constants found in the lepton report. In that report universal mathematical-geometric constants for M / L and Q^2 / L were found which described the leptons' wave patterns.

6 Concluding Thoughts On Demonstrations And Procedural Efforts Throughout Analyses Of Measurement Systems I, II, & III

In the lepton and photon reports three key physical property constants were developed from mathematical-calculus-geometric considerations. These were:

electron $mass^1$ / radial distance, 1.861432 x 10^{+05}(M relative/L absolute)
electron $charge^2$ / radial distance, 5.245406 x 10^{-03} (Q^2 relative/L absolute)
the photon constant 1 / (2α) = 68,517,994,75 (ML)(L/T) absolute units

This first constant and analogous ones for the other lepton members correctly lead to the ratios $m_{e\text{-rel}}/l_{Sgs}$, $m_{\mu\text{-rel}}/l_{Sgs}$, $m_{\tau\text{-rel}}/l_{Sgs}$ and their masses m_e = 9.109,389,7 x 10^{-31} kg, m_μ= 1.883,532,7 x 10^{-2}kg, and m_τ = 3.167,88 x 10^{-27}kg. The second constant lead to the correct description of the charge of the leptons e^2_{rel}/l_{Sgs} and e = 1.602,177,33 x 10^{-19}C. This photon constant with its mathematical-geometric description including its absolute measurement units of course leads to the Planck constant 6.626076 x 10^{-34} (kgm)(m/s).

Here in Analyses of Measurement Systems III the necessary measurement system analyses were performed for these several mathematical-geometric subatomic physical property constants. This was done with multiple sets of side-by-side systems of scales. These overall systems included both the underlying sets of relative scales and the absolute counterparts scales which derive from these bases.

When correctly handled two of the systems, the SI and Binks systems, were found to produce the same numerical value for the mathematical-geometric constants of concern. One of the two supposed systems of scales, the Binks systems, used in this successful demonstration is in fact completely fictitious and was at least partially based upon random numbers. The other system of units involved is an equally arbitrary invention of humans which has cobbled together several individual relative scales to make a unified system. This is the SI set of measurement units.

Concluding, these reports Analyses of Measurement Systems I, II, & III the validity of these constants with their units have now been confirmed from an entirely independent approach, that of the analyses of measurement systems.

An interlinked mix of absolute parameters was used for the three key physical property constants that were developed in the lepton and photon reports and again demonstrated here in Analyses of Measurement Systems I, II, & III. The units of distance were used in all three of these demonstrations, variously in both algebraic positions, numerator and denominator. Distance was used in the numerator as a squared quantity and in the denominator as a linear quantity. The units for time were used in one of these layouts. The units for the quantity of mass were used in two of the presentations, and the units of the quantity of charge were used in one presentation as a squared quantity. This across property linkage of the absolute parameters again excludes the numerical values of these constants from being chance, or just being coincidental. This is such as being due to the size of the human relative distance invention, the meter, which underlies them. The absolute physics Squigs scales as setup and defined in Measurement Systems Bases are confirmed as meeting the definition of being absolute. This is to say that these conceptual units do show or help display some of the realities of the wave forms of the subatomic realm.

In Analyses of Measurement Systems I, II, & III the arbitrariness was emphasized of the distance and time scales of the two systems of units which validated the necessary physical constants. The total independence of these measurement systems was seen. This was not the same as their complete separateness though, since they did refer to the same real physical world. What holds these systems together is their absolute base references reveal something about the relationships between the primary forces and elementary particles of the subatomic realm. This is what allowed the analyses to be made as was done here.

The only constraining criteria or the caveats for the demonstrations here were both underlying relative systems must have SI analogous sets of units and the absolute systems must be Squigs analogous. That is:

1 The base relative unit of mass, M, has a 1:1 correspondence with base relative unit of length, L. Mass can be $\propto L^1$, L^2, L^3, or L^n according to the number of dimensions of the mass expression being described.
2 The base relative unit of charge, Q, has a 1:1 correspondence with the base relative unit of length, L such that $Q \propto L^{1/2}$.

Concluding, two sets of scales are not needed. One set of SI analogous relative scales with its partner Squigs analogous absolute scales with the proper data works just fine, regardless of how random or arbitrary the measurement units of time and distance! The only reason two scales were used or needed here was to highlight what was done and to show that the results were not artifacts of the single system of SI scales with which human science is familiar.

Concluding, in this report Systems Analysis III and previously in Analyses of Measurement Systems I the technical challenge of the algebra of measurement units has been met. The objections of various nay-sayers and detractors concerning the use of mathematical-geometric physical property constants with units have been countered. These physical constants as specified are valid mathematical-geometric results and can be used in the four technical reports on the leptons, photons, charge of the quarks, and Ternary Force Interaction constant.