Space Lattice Theory

A Lattice Theory for the Universe

A Theoretical Search for the Grand Unification of

Matter, Energy, Space and Time

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With figures

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Abstract

Space Lattice Theory is a study of the fundamental structure of the universe. The study asks what that structure might be like if, instead of being mostly an empty void, space is a densely packed, crystal-like Lattice, and the existence and interaction of what we call matter is due to movable defects or dislocations in the Lattice. This theoretical study found that a dislocation model could produce a comprehensive set of simple, visualizable explanations for most of the concepts of physics, including many that are currently unanswered. It explains matter, time, cause and effect, energy, and how energy converts to matter. It explains gravity and electric and magnetic fields; how they can be physical realities, and how they could work.

Space Lattice Theory supports a "big bang"-like beginning for a 3-D "visible" universe, explaining how it could easily emerge from what appears to be the nothingness of space, but without having to change any laws of physics. Puzzles like the particle-wave nature of photons are explained. Problems with current theories for subatomic particles, cosmology and Special Relativity are discussed. New models are suggested.

Most significantly, Space Lattice Theory presents a comprehensive model for the Grand Unification of all forces and matter in the universe.

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1 Introduction

1.1 General editorial notes

This document introduces many concepts which are new to both classical and modern science. Poor concern for precision in the creation and use of terminology has created substantial misunderstandings for science and our society. A **glossary** is provided at the end of this document to clarify the specific understanding of terms of special importance as used in this document. The first critical use of a listed term where the term is **defined** is shown in **caps**: e.g. LATTICE. When a term is used that has multiple meanings in common use, or appears to be trivial, based on common use, but has a **critical meaning** in this document at the point of use, that term is shown in **bold type**: e.g. **Lattice**. If a term is commonly used in science, but this document uses a meaning that is less frequently used, or must be understood in a particular way, or the term is frequently misused or generalized, that term will be highlighted by quotation marks: e.g. “Lattice”.

The document is organized to present material for reading in numerical page number order. Concepts presented later in the document depend on explanations and terminology presented earlier. At times, the planned order does not justify providing a complete explanation for a concept upon its first mention. In those cases, the concept may be initially presented in generalized terms.

A number of figures are included in or with the document. In these figures, there are two different types of depiction being used. A VISUALIZABLE DEPICTION is a drawing that could possibly represent the actual geometry of an object. A visualizable depiction is also referred to as a PICTORIAL depiction. A FUNCTIONAL DEPICTION is a stylized representation of the components of an object that attempt to describe how they act functionally, or how they interact with other physics elements. Only the components important to explain functionality are included in a functional depiction.

Document references in the text are enclosed with braces and identified by author and date {Einstein 1916} when applicable. General references are identified by reference number, e.g. {38}.

1.2 Purpose and fundamental assumptions

The purpose of this paper is to share the results of a theoretical exploration that discovered a simple yet comprehensive set of explanations for the full range of "explained" physics principles, plus many as yet unexplained fundamental principles of physics. The thought experiments in the study were suggested by exploring the ramifications of four assumptions about the fundamental nature of "matter" in the universe:

ASSUMPTION 1: the entire foundation of the universe is a **Structured Lattice.** The Lattice fills the universe. The Lattice exists as a **structured arrangement** of a **single** "**object"** referred to in this paper as an **Aa**. The structure of the Lattice is produced by a **self-organizing** property of the Aas, which acts to maintain that structure in the event of disruptions to the Lattice.

ASSUMPTION 2: The Lattice is an **inherently pressured Lattice**. The Lattice structure is determined by the shape of the Aas, and is maintained by the pressure on the Aas. **All forces** observed to act on **particles** of **matter,** or which act on **flows** of **energy** through the Lattice, are generated, **entirely**, by **distortions** in the **Lattice**, through **pressure** imbalances**.** There are **no attractive (tensile) forces** in the Lattice or particle interactions.

ASSUMPTION 3: the property that physics refers to as **matter** is produced, not by a tangible, physical substance, but by a **disruption** in the Lattice. The disruption is caused by the absence of Aas from the regular Lattice structure. Each missing Aa creates a **dislocation** in the Lattice. Each dislocation causes a **local density reduction** in the Lattice, which is communicated outward without limit, with **spherical symmetry**, with **decreasing magnitude** in proportion to **distance**. The Lattice density variation pattern caused by the dislocation is what physics refers to as **gravity**.

ASSUMPTION 4: the property classically known as **electric charge** is produced by a **special arrangement** of **dislocations** which **add** a second Lattice structure pattern to subatomic particles. The special arrangement of the dislocations causes a **twisting pattern** in the Lattice. The twist is communicated outward in a **pancake configuration** with **decreasing magnitude** over **distance** without limit. The Lattice twisting pattern

caused by the added dislocation arrangement is what physics refers to as both electric and magnetic **fields**. These fields are a phenomenon of the **same Lattice elements** that produce gravity.

These four assumptions, working together, suggest that the concept we call SPACE, the UNIVERSE, or the GREAT UNIVERSE, which is space in its entirety, is **not** predominantly an empty **void** sparsely dotted with ”objects” composed of what we call matter. Instead, it is a **densely** packed universe filled throughout with a very small “OBJECT”, in this paper called an “AA”. The Aa occurs in only **one form**. The Aas are pushed together by an inherent universal **pressure.** The Aa has some geometric property that causes Aas in proximity, due to the pressure, to self-organize into a structured **Lattice**.

The property we call **matter** is not a physical substance, but rather, exactly the opposite. Matter, or more precisely, the behaviors we relate to matter, are caused by a **dislocation** or hole in the Lattice where an Aa is missing from the expected uniform Lattice configuration. **All forces** in the universe are caused by the universal pressure acting on non-uniform geometries. There are **no attractive forces** in the universe.

The collection of theoretical observations and principles that are suggested in this document by the hypothetical results of introducing dislocations into a universe densely filled with small objects that form a structured lattice framework, are referred to in this paper as **SPACE LATTICE THEORY (SLT)**.

1.3 Motivational Background

The floundering of science

> “From the beginning of physics, there have been those who imagined they would be the last generation to face the unknown. Physics has always seemed to its practitioners to be almost complete. This complacency is shattered only during revolutions, when honest people are forced to admit that they don't know the basics… We live in one of those revolutionary periods, and have for a century.” {Smolin 2006}

In his book, Smolin lists 5 major problems that remain unanswered for physics. One of those is, "Determine whether or not the various particles and forces can be unified in a theory that explains them all as manifestations of a **single, fundamental entity**." While this is logically appealing, there is no fundamental principle that mandates there must be only one. Classical theory certainly suggests that gravity and electro-magnetism are caused by different **co-existing** principles. One of the strongest motivations to conduct the extensive explorations described in this paper was the early appearance of patterns that suggested such a "GRAND UNIFICATION" was possible.

Personal Experience

The environment that led to the initial formulation of the SLT assumptions resulted from the convergence of six personal experiences:
(The first 3 are discussed further in section 14: Problems with Existing Theories.)

1. The speed of light problem

As part of high school physics, I was told about the Michelson-Morley experiment and how it reported finding a "**null**" result. As presented to me, "null" was stated to mean **zero**. This "null" result was supposed to **prove** that the "aether" concept was false. I was curious about the details of the experiment and found and read a copy of the original paper. The "null" claim was **clearly misunderstood**. It was **not** a pronouncement of finding **zero** aether speed. It was a statement about the experimental observations **not** achieving the **hypothesized** experimental **goal** of finding an aether flow with the same rate as the known rotation speed of the earth in its orbit. Michelson assumed the aether was stationary, linearly with respect to the sun, and rotationally with respect to the distant stars. The experiment recorded a flow rate about **half** the earth orbit rate. It was clear that the summary I was provided in physics class was very misleading. I followed that trail and found references to many experiments that did not agree with Michelson-Morley. However, none of my physics professors in either high school or later at MIT would acknowledge these other experiments, dismissing them as "incompetent" in the face of a **settled** issue.

2. Einstein's SPECIAL THEORY OF RELATIVITY (SR)

Early in high school, I read a book about Einstein and the social and scientific environments that led him to produce what has become known as the Special Theory of Relativity. (I regret I have been unable to find that specific book again to produce a citation. Another is provided below.) Around the time SR was written (early 1900s), public and scientific views were emerging that the speed of light was **constant relative** to the **observer**. Einstein, according to my reference, believed that concept was **logically** unsupportable. The book stated that he set out to produce a paper with the goal of quantifying the physics that would result from such an assumption to **quell the fad**. He believed that by showing how bizarre physics would become to support the assumption, scientists would easily reject the idea (Occam's razor in the extreme). In short, Einstein did **not** believe that his "Special Theory" was an accurate depiction of physics. To the contrary, it was his intent to produce an indirect "proof", starting with the assumption that "light speed was constant with respect to the observer", to **disprove** the assumption. As summarized by Auffray,

> "His [Einstein's] **long-standing rejection** of **relativistic spacetime** and his life-long lack of acceptance of the quantum theory as it developed during his lifetime are well known… Einstein destroyed his manuscript shortly after his paper appeared in print. And he subsequently abandoned the line of reasoning he had proposed in this paper to establish the Lorentz transformation. No major physics textbook … has ever taken the pain to reproduce Einstein's original line of reasoning. Einstein himself never returned to it…" (Auffray 2007)

As we know, to the contrary, Special Relativity was adopted as the "standard model". I believe this misunderstanding has led to a tragic hundred year blind alley for science.

3. Problems with the Standard Model of Physics

It has long concerned me that science has failed to produce a consensus model for the **fundamentals** of the universe that provide verifiable **visualizable** principles for **any** of them, despite having mathematical relationships with such high precision for most of them.

4. Discrepancies in SR teaching

I studied SR in high school, throughout college, and in post-grad studies. To support those studies, I read a lot of explanations about how SR applies to specific situations and worked out many application assignments. The ubiquitous discrepancies in the explanations and differences among my professors added to my uneasiness. Mainstream science, to its discredit, has avoided comprehensively addressing these discrepancies, appearing, rather, to want to avoid them as they get buried in a historical landfill of confusion.

5. Scientific fraud and misrepresentation of SR in the media

I already mentioned the imprecise reporting of the Michelson-Morley results (the **null** problem). A similar, but intentional, imprecision was related to starlight bending. As recently summarized by the Huffington Post,

> "That's what the astronomer Arthur Eddington did in 1919 when he cherry-picked among his observations of an eclipse. The idea was to prove Einstein's general theory of relativity. However, Eddington's analysis of the data was questionable enough for the Nobel Prize committee to exclude relativity from Einstein's 1921 Nobel Prize for physics."{Brooks 2012}

The press further exaggerated Eddinton's experimental findings by relating them to Einstein's theories **broadly**, when the experiment was aimed narrowly at the gravitational principle of General Relativity as it relates specifically to the phenomena of light.

6. Studies of dislocation theory

I learned about dislocations studying metallurgy and semiconductor physics. It was shear coincidence, and also very surprising, when I drew a connection between dislocations and Einstein's gravitational fabric given that dislocations and **knots** in a fabric are conceptual opposites. My interest in a Space Lattice began with the dislocation concept of assumption 3. (discussed at length below.)

Once I envisioned assumption 3, the motivation to follow it was brought to life by how quickly, and **simply**, the model **solved**, from a functional standpoint, some of the **most fundamental puzzles** of physics, including Grand Unification (Occam's Razor again).

This paper presents only preliminary observations. Nonetheless, the concepts lead to so many simple, but broadly insightful answers. Even though they may fall short of the rigor needed to establish precision in scientific verification, they are already sufficient to open new channels of thinking to solve some of the "great" puzzles that have eluded science for millennia.

I also drew enduring confidence from something Einstein stated in his General Theory of Relativity about the classical theories upon which General Relativity was contrasted:

> "No fairer destiny could be allotted to any physical theory, than that it should of itself point out the way to the introduction of a more comprehensive theory, in which it lives on as a limiting case."

SLT quickly presented an opportunity to be part of this kind of growth process.

1.4 Scientific background

For most of human history, it was commonly believed that the earth's atmosphere was a void. A VOID, in conventional science, is a volume of space that does not contain matter. It may, however, contain a "field". In SLT, a void is a volume of space that does not contain structured Lattice. It may be as small as the interstitial space between closely packed Aas, or as vast as a galaxy. In SLT, however, it can not contain a field. It is totally empty.

Observations of some scientists, at least as early as Aristotle, that air was actually composed of invisible atoms, wasn't generally accepted, even by science, until the 17th century. Issac Beekman, in 1618, compared air to water and the phenomenon of pressure increase at depth. Galileo and Descartes "steadfastly" disagreed. {16} Torricelli created a "sustainable" vacuum around 1644. {2} "Pascal's vacuum-in-a-vacuum experiment [~1646] and his theory of pressure equilibria resulted in the determination that the pressure exerted by a vacuum is zero." {2}

The term “gas” was only first used by Helmont in 1671, “to define a state of matter other than liquids or solids.” {16}

The importance to science of accepting the principles of a vacuum, and specifically, that the pressure of a vacuum is **zero**, was the corollary that a vacuum was **incapable** of exerting **any** negative force on the **surface** of an object. Negative here means that the direction of a force applied to a surface cannot be away from the solid composition that defines the surface. This meant that **all** “mechanical” forces produced by gases and liquids required explanations based **only** on **pressure**. The value of this observation was critical for science to correctly explain many principles and explain the inaccuracy of generally accepted notions that were incorrect.

Space Lattice Theory suggests there is a similar principle that universally applies to **all** material configurations, not just surfaces. That is, SLT suggests that, at the fundamental particle scale, there are **no tensile forces** of any form in the universe. By TENSILE FORCE is meant the ability of any entity A to interact with another entity B by causing a force in B that is directed toward A based on development of a tension state in entity B. That is, **all forces** in the universe, at the fundamental particle scale, occur as **pressure** driven **forces**. These pressure forces create forces on macro scale objects by generating compression states in the molecular bond structure of those objects. For example, this pressure principle implies that the tensile behavior of metals is not due to atoms “pulling” on each other, but rather the development of unbalanced pressure in the atomic bond structure of the atoms whereby some force is **pushing** atoms toward each other. SLT suggests the same principle will apply to all “forces at a distance”: i.e. gravity, electromagnetics and the weak and strong nuclear forces.

This principle could have been stated as “there are no **attractive** forces in the universe”. However, the term “attractive” is often applied in the same way as the term “vacuum”, and can easily lead to a misunderstanding. For example, it might still be said that two planets “attract” each other, while, at the atomic and subatomic levels, SLT suggests that the gravity fields of the two planets interact in such a way that the atoms of each planet are being **pushed** towards the other planet, **rather** than being **pulled** toward the other planet.

The confirmation of this principle in physics would require a major transition in our scientific understanding of the basic structure and function of matter and the universe.

In the General Theory of Relativity {Einstein 1916}, in the section titled "The Gravitational Field", Einstein states (emphasis added):

> "If we pick up a stone and then let it go, why does it fall to the ground? The usual answer to this question is: "Because it is attracted by the earth." Modern physics formulates the answer rather differently for the following reason. As a result of the more careful study of electromagnetic phenomena, we have come to regard **action at a distance** as a process **impossible** without the intervention of some **intermediary medium**."

He then describes the interaction of a magnet and a piece of iron, stating:

> "…we cannot be content to regard this as meaning that the magnet acts directly on the iron through the intermediate empty space, but we are constrained to imagine — after the manner of Faraday — that the magnet always calls into being something **physically real** in the space around it, that something being what we call a "**magnetic field**… The effects of gravitation also are regarded in an **analogous manner**. The action of the earth on the stone takes place **indirectly**. The earth produces in its surrounding a **gravitational field**, which **acts** on the stone and produces its motion of fall."

Einstein's paper then goes on to add mathematical depth to these observations. However, there is something else Einstein stated in the same section that has been broadly ignored by the scientific community:

> "We shall not discuss here the **justification** for this incidental conception, which is indeed a somewhat arbitrary one. We shall only mention that with its aid electromagnetic phenomena [and by analogy, gravitation] can be theoretically represented much more satisfactorily than without it..."

Each of the highlighted words and phrases in the previous quotations are concepts that Einstein and the scientific community have still failed to explain in even a rudimentary

way. Extensive theory development has produced mathematical functions that describe relationships between observed phenomenon to very high precision. Technology has produced amazing instruments that can also measure the interactions of material with high precision. However, the scientific community has still failed to produce **provable, physically visualizable models** for even the most basic scientific concepts, which is what Einstein meant by the word "justification". By "physics models" I mean functionally accurate humanly visualizable depictions of the basic components of the universe. One ubiquitous exception to this statement was the heliocentric Bohr atom model, which itself is now considered inaccurate.

In the Einstein quotations above, he uses the terms: "intermediary medium … magnetic field … gravitational field". What are they? Einstein doesn't provide further insights, stating only that they **must** be "something **physically** real".

As important as it is to explain these highlighted terms, there are equally important concepts that are **missing**. The fields are said to produce ACTION AT A DISTANCE. What does that mean? Might "**action**" be a force that causes an entity to spin? Vibrate? Change color? Disappear into nowhere? Appear out of nowhere? Einstein's obvious intent was that **fields**, through some "**process**", induces an acceleration in physical entities that interact with it. Given this requirement, it still needs to be determined if the acceleration is caused by a **pulling** process or a **pushing** process, or possibly both under differing conditions.

In figure 4 of the General Theory of Relativity, Einstein showed a set of six curved lines in a plane arrayed as a 3 X 3 curved trellis to support discussion of a Gaussian co-ordinate system and relate it to a rectilinear Cartesian co-ordinate system. The figure was later used by Einstein as a two dimensional model to visualize a gravitational field. The figure, which looks like a magnified portion of a woven cloth, eventually led others to refer to the gravity field as the **fabric** of space. This has prevailed for as long as Bohr's atom.

Unfortunately, as frequently happens in both science and society in general, the casual selection of terms or graphics to illustrate one narrow issue, can later turn around to cause very adverse conceptual problems when applied to broader issues. **Fabric** is one

of these terms. In common use, a "fabric" has inherent properties. It is made of threads. Threads are typically long continuous filaments. They are strong in tension and approach the geometry of a straight line when under tension. Under compression, however, they buckle and twist with no simple or repeatable structural shape. Under tension, strings are observed to be easily set into vibration exhibiting a simple set of dynamic geometric motions that are easily describable wave functions. However, under dynamic motion which does not put the strings in tension, they have a tendency to fold, tangle and form **knots**! These forms are extremely complex and not easy to describe. The attempt by science to describe space with models based on "strings" is not coincidental. The notion that "**mass**" might be "**knots**" in the fabric of space is not a coincidence either. Once Einstein presented the visual model of space as a fabric, it was imprinted in the minds of every student who encountered high school physics or popular magazine and television science programs. The link between a fabric, a knot in the fabric, and an object in a space fabric that is round and hard, is straightforward.

In 2004, Smolin wrote an article for Scientific American about Loop Quantum Gravity. In the article, he states,

> "since ancient times some philosophers and scientists had speculated that if matter were broken up into small enough bits, it might turn out to be made up of very tiny atoms. Few thought the existence of atoms could ever be proved… In recent decades, physicists and mathematicians have asked if space is also made of **discrete pieces**. Is it **continuous**, as we learn in school, or is it more like a piece of cloth, woven out of individual **fibers**?"

According to Loop Quantum Gravity, the fundamental substance of space is a **small volume**. The volumes fill space. Unfortunately, his visualization stopped there. It didn't address either mass or gravity. A figure in the article was titled, "**matter exists** at the **nodes** of the spin network." The figure depicted a 3-D version of Einstein's fabric of space with mass being "**knots**" in the fabric. The "knots" in the figure were connected by short, discrete lengths of thin strings, which is an obvious fabric model.

While studying metallurgy and solid state electronics in 1968, I was introduced to the concept of dislocation theory. This theory was presented at that time as a

"breakthrough" in explaining why typical metals were much weaker than crystals of the same material. Evidently, the professors teaching the class didn't know that dislocation theory was actually already quite advanced in metallurgy by the late 19th century {Hirth 1934}. I made no connection between dislocations in dense matter, such as metals, and space at that time. However, after reading Smolin's article, I remember waking from a fitful sleep, with the question: what if the "knots" in Einstein's fabric were replaced with "**holes**", the "holes" being dislocations?

2 Foundation

2.1 Space Lattice basics

Space Lattice Theory (SLT) concepts for the Lattice are based on the following postulates which expand the basic assumptions of this paper:

1. The basic constituent of the universe is a very small object. The object is unique - there is only one form in the universe. In this paper, the object is referred to as an "Aa".

2. The universe is a conventional 3-dimensional space which is completely and densely filled with Aas. The Aas are in **physical** contact with each other. The COORDINATE SYSTEM for SLT is a rectilinear, 3-D Cartesian system. Axes descriptions use the "right hand rule" and rotations are positive in the counterclockwise direction.

3. The Aas are tightly pressed together as if they are under a **pervasive universal pressure** which acts like a fluid pressure. This pressure establishes an **energy density** for the Lattice which continuously moves in time and location but is conserved as a **constant** for the Great Universe.

4. The shape of the Aas causes them to self-organize and align to become a universe filling STRUCTURED LATTICE. The term LATTICE implies a regularly repeated three-dimensional arrangement. The term "structured Lattice" means the Aas form a simple repeating **geometrical pattern** that continues in all 3 dimensions throughout the infinite expanse of the Great Universe maintaining a **long-structure** character.

5. The term LONG-STRUCTURE means that an element of the repeating geometrical pattern of Aas in one geometric pattern must touch a corresponding element in an adjacent pattern, which has an identical overall pattern, in such a way that a single, non-branching, non-converging path can be followed indefinitely throughout space. The term "path" is used here because the long-structure will not be a geometric straight "line" but rather a continuously changing set of zigzagging line segments between Aas that approximate a **spline** over cosmic scales.

6. The basic long-structure shape will approximate a straight line LINEAR STRUCTURE unless disturbed by forces that develop in the Lattice that bend the lines.

7. If the structured pattern of the Lattice is disrupted, the self-organizing property of the Aas acts to restore the structure. This is called LATTICE HEALING.

8. The Lattice is semi-rigid like that of a crystal Lattice and experiences elastic deformation.

9. The Lattice appears isotropic at scales much greater than the size of an Aa. The Lattice is not isotropic on the scale of the Aas.

10. The term PRISTINE LATTICE refers to the geometry of a universal space Lattice that would occur in a theoretically static undisturbed uniformly pressurized universe. Being a theoretical concept, there may be no occurrences of pristine Lattice in the universe. The term PREVAILING LATTICE refers to the geometry of the universal space Lattice at any point just prior to being affected by an approaching particle or field event.

2.2 Matter basics

A basic concept behind SLT is the assumption that the property called **matter** in the universe is caused by a **dislocation**. More precisely, matter is **not** caused by the **occurrence** of a tangible, physical substance in an otherwise empty space. Instead, it is caused by the **absence** of some tangible, physical substance, i.e. an empty space, where some substance was expected based on the regular **structure** of the physical **Lattice.** There is no physical "node" or conventional mass associated with the contact points of the Aas.

While challenging common intuition, what makes the SLT model significant is observing that **all** the interactions we observe in nature between objects, which we relate to the properties we call matter and energy, can be explained by the presence, motion, and interaction of **dislocations.**

A LATTICE DISTORTION occurs when the shape or scale of the Lattice differs from Pristine Lattice, but no long-structure lines are broken. All distortions in the Space Lattice can be categorized as bending.

A DISRUPTION is an uncontrolled environment that occurs when the prevailing Lattice structure breaks down and makes one or more long-structure lines discontinuous. The disruption is resolved when the Lattice pressure and inherent "self-assembly" properties of the Aas reassemble the Lattice forming continuous long-structure lines or **confine** the disruption within continuous long-structure lines. A dislocation is a confined disruption.

A DISLOCATION is a disruption in the Lattice in which the normal continuous repetitive structure of Pristine Lattice is locally disrupted by the absence, addition or misalignment of one or a small number of Aa elements. The localized disrupted area is referred to as the **near field** (which will be discussed in depth later). Directly surrounding the near field, the Lattice structure is continuous.

Dislocations can include: 1. removal of an Aa from the structure; 2. a forced insertion of an Aa into the structure; or 3. A rotation of an Aa into a stable position that crates a discontinuity in a Lattice structure line from prevailing Lattice.

A DISLOCATION STRUCTURE is a collection of dislocations, and particularly the stress-strain state in the Lattice caused by that specific collection of dislocations.

A BENDING distortion occurs when the Aas in the Lattice, viewed over a **region** of the Lattice, vary in position from their expected positions in a pristine Lattice, but the regular geometric structure of the Lattice can be traced through the region without encountering a disruption, i.e. any loss of structure.

A characteristic that distinguishes bending from dislocations is the shape of the long structure lines in the Lattice surrounding the distortion volume. The structure lines around a **dislocation** bend in opposite directions from each other, either outward from or inward toward the dislocation. The lines that pass through a bend distortion are always approximately parallel, i.e. equally spaced. This will be discussed in depth in following sections.

2.3 Energy basics

In SLT, ENERGY appears in the following forms:

1. Potential energy – which is the elastic energy of the Aas in compression, either in linear compression or bending. This energy can not be negative.

2. Kinetic energy – which is the dynamic energy of Aas in motion due to the inherent inertia of the Aa.

Specifically, SLT suggests there is no other form of energy in the universe. That is, all gravitational, electromagnetic and mechanical energy are due to specific patterns of Aa compression and motion. These three subdivisions will be explored in detail in this paper.

3 The Lattice

3.1 The Aa

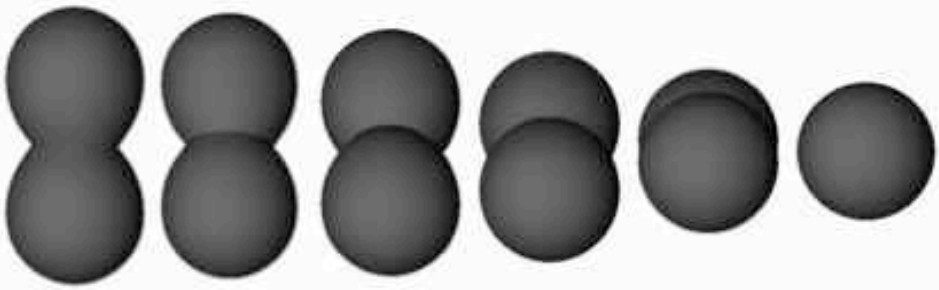
The "Aa" is a small object that is the basic constituent of the universe. The object is unique - there is only one form in the universe. The entire space Lattice is constructed of **densely** packed Aas and nothing but Aas. There is nothing between the Aas and no special forces such as fields exist between or within the Aas.

In this paper, the Aa is envisioned as an elongated body, with axial symmetry, having 2 spherical ends of equal size. The spheres are joined at the center of the body with a blending structure. This configuration is shown **pictorially** in Figure 1 below.

This paper does **not** claim empirical evidence for the shape of the Aa. That knowledge would be established by empirical testing. Additional example configurations which might depict a single Aa are shown in Figures 2 a-d below. These figures show configurations with 2, 3 and 4 lobes. The figures also show variations of the ratio of overall size to the diameter of the spherical ends. In the figure, variable D is the diameter of a minimum circumscribing sphere that would contain the Aa. Variable d is the diameter of the end spheres, each of which have the same diameter.

Possible additional variations in the shapes could include: longer blending bodies, differences in each blending body, variations in the shape of the blending section; different size end spheres, and facets or irregularities in the spheres and body section.

For discussions in this paper when drawings are used to explain how the Aas are envisioned to function, the form shown in Figure 1 with 2 end spheres and with D/d=2.00 will be used.



A single Aa: 2 spherical ends, elongated body, blended, D/d = 2.00 . Rotations shown at 0, 20, 40, 60, 80, 90 degrees.

Fig. 1

An Aa

a.

A single Aa: elongated body, 2 spherical ends, truncated cone blending, D/d = 2.05

b.

A single Aa: elongated bodies, 2 spherical ends, conical blending, D/d = 3.20

c.

A single Aa: elongated bodies, 3 spherical ends, conical blending, D/d = 4.00

d.

A single Aa: elongated bodies, 4 spherical ends, conical blending, D/d = 3.00

D = diameter of circumscribing sphere
d = diameter of end sphere

Fig. 2

Examples of potential Aa shapes

While not being able to suggest certainty in the shape of the Aa, theoretical observations can be made that constrain its possibilities:

1. The Aa can not be just a single sphere, spheroid, or single spherical faceted object. A single sphere would not provide geometry that would promote self assembly into a **structured Lattice**. That is, the Aa can not act like a molecule in a simple fluid. An important corollary of this observation is that the fundamental elements of the universe probably **are not spherical**.

2. The Aa can not have too many ends. Even 3 may be too many. These could interlock and prevent easy passage of dislocations through the Lattice.

3. The geometry of the Aa, specifically the precision of the ratio of the circumscribing sphere diameter D to end sphere diameter d, is critical. Very small changes in the D/d ratio, on the order of 2%, could critically affect the Lattice structure.

The Aa used as the model for this paper is characterized by the following properties:

1. A "solid" elongated body, with axial symmetry, having 2 spherical ends of equal size. The ratio of circumscribing sphere to end sphere diameters, $D/d = 2.00$. The spheres are joined at the center of the body with a blending structure as shown **pictorially** in Figure 1.

2. Elasticity in linear compression, both axial and radial. The **change** in **linear dimensions** of an Aa due to pressure variations is called STRAIN. The pressure that causes the linear variation is call STRESS. The ratio of stress to strain is the **elastic constant** of the Aa in Young's modulus format. The elastic constant of the Aa is one of the fundamental constants of the universe and is quantized to one specific value.

3. An absolute zero of stress. In the prevailing Lattice, the Aa is under compression. Under severe events, the Aa may separate from adjacent Aas and its environmental pressure may be reduced to zero. There is **no** event in the universe that can create a stress lower than zero. That is, there are **no** tension forces in the Lattice. Stress levels in the Lattice are continuous and **not** quantized.

4. Both positive and negative strains. The strain of an Aa, both axial and radial, in a free static form is zero. The strain may vary with both positive (compressed) and negative measures from zero. One case is due to a dynamic release from a compressed state during which the Aa can overshoot its static length. The Aa can also show a negative strain from a bulk modulus response to radial compression.

5. Elasticity in bending. In the prevailing Lattice, the Aa does not experience any bending unless it is part of a field structure. Bending is continuous and **not** quantized.

6. Inertia in both linear and rotational motion. The inertia is probably distributed throughout the Aa as if the Aa was a solid with uniform density. The inertial properties of both linear and rotational motion are quantized. The inertial properties of the Aa are fundamental constants of the universe, and quantized to one specific value.

7. The discrete values of elasticity and inertia along with the geometric parameters of the Aa define the elastic and inertial constants of the Lattice, which in turn define a **Lattice Relaxation Response** for the Lattice.

8. No external friction. No internal plasticity.

9. No thermal properties. All "heat" properties related to the Lattice are a measure of vibrations of the Lattice structure. The Aas themselves do not exhibit any temperature properties.

These factors are discussed further in relevant sections.

3.2 The Lattice

Lattice structure

The geometric properties of the Aas, in a frictionless environment, cause them to self-organize and align into a universe filling structured Lattice.

A Lattice with Aa dimensions D/d = 2.0 (the preferred geometry)

A portion of the Lattice is portrayed in multiple views showing a 3-D structure in Figure 3 below. This Lattice would be the self-assembly geometry produced by an Aa with D/d = 2.00. In this geometry, the end spheres of the Aa are spaced as they would be if the spheres were independent touching spheres with a blending connection. This results in a Lattice with a conventional hexagonal closest packed arrangement of the spheres. The arrangement is symmetrical along 3 Cartesian axes. What makes the Lattice different from a simple closest packed sphere arrangement is the grouping of spheres into connected pairs to form each Aa. This pairing results in an alignment of Aas that can be traced as if they were part of long structural strands. The paring is highlighted in the lower views of the figure by a light shading of the central body.

The Space Lattice extends throughout the entirety of a single 3-D universe infinite in all directions. The Lattice is composed entirely of Aas, which therefore completely fill the universe. The Aas are under pressure, analogous to the hydrostatic pressure on water molecules in the ocean. The cause of this pressure is an inherent property of the universe. It is not caused by any tensile force like gravity. The function of **structure** in the Lattice is to "telegraph" any change that occurs at one point in the Lattice to **every** other point in the Lattice.

The Lattice can be "locally" **disrupted** in both small amounts and large amounts on many different scales. When this happens, Aas move relative to each other, creating temporary voids in the Lattice. The universe itself, without the Aas would be a **continuous void**. The Aas move through the Lattice and voids in the Lattice in continuous motions. The rest locations that an Aa can hold, however, are "quantized" within the Lattice by the geometry of other Aas in the structure.

The Aas are self organizing due to their shape. That means, after a disruption, due to the pressure of the remaining Lattice and their shape, the Aas in a local area would reorganize and heal the Lattice in an arrangement similar to the larger surround of the Lattice as the disruption closed up. This does not imply that the structure would either perfectly reform into the structure of undisturbed space, nor reform identically matching a disturbed local area that existed before a larger disruption. But the Aas would always reassemble into an arrangement "allowed" by their shape.

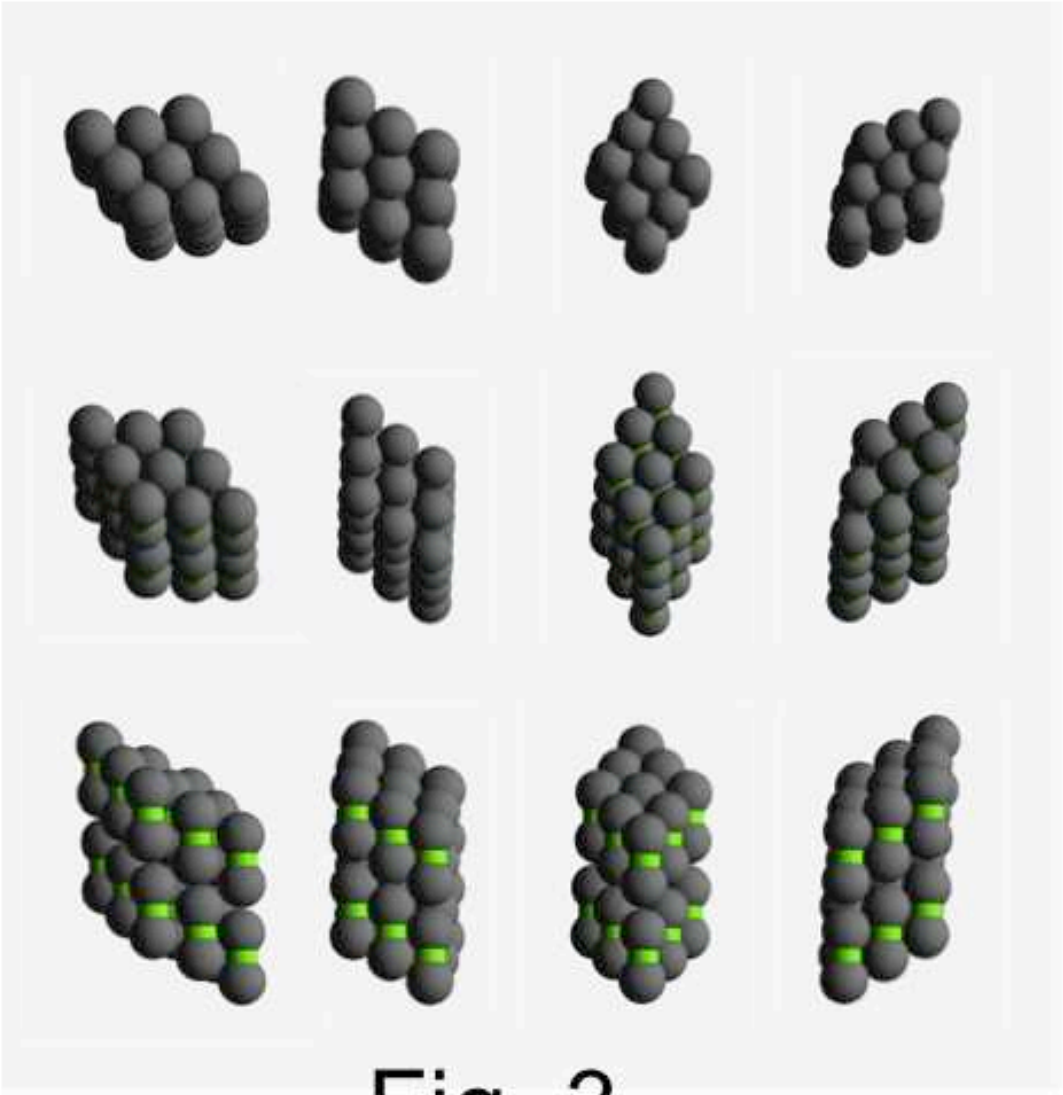


Fig. 3

3-D Lattice views for a 2-sphere Aa
with D/d = 2.00

A Lattice with Aa dimensions D/d = 3.00 (shown only as a comparison geometry)

To explore the sensitivity of the Lattice to Aa geometry, a Lattice was constructed using Aas with dimensions D/d= 3.00. The result is shown in Figures 4 and 5 below. Figure 4 a shows a single Aa with 2 spherical ends and an extended connecting structure. The most prominent differences between the Aa = 3.00 D/d Lattice and the Aa = 2.00 D/d Lattice are that the 3.00 Lattice is not symmetric in three axes and the spheres of the Aas are arranged in a rectilinear pattern. View 4 b appears as a face-centered rectilinear Lattice with single spheres (shaded solid gray) resting in the center of 4 spheres (shaded with checkerboard) that form a square but do not touch each other. View 4 c presents the rectilinear structure in the x-z plane. In this view, the Aas are spaced along two axes, x and y in this case, at uniform intervals which are the same as seen in the b. view. In the third axis, z in this case, the spacing has two different repeating intervals. Two spheres representing different Aas touch. Then there is a body section with length equivalent to one sphere diameter, which connects to the other sphere of the same Aa.

Figure 5 depicts a pictorial 3-D perspective view of a D/d=3.00 Lattice with multiple views. The views on the left from top to bottom show rotations around y at approximately 0, 30, 45, 60 and 90 degrees. Three views are shown of the 30 degree rotation additionally rotated around the tilted z axis. The bodies and spheres have various shadings to help visualization.

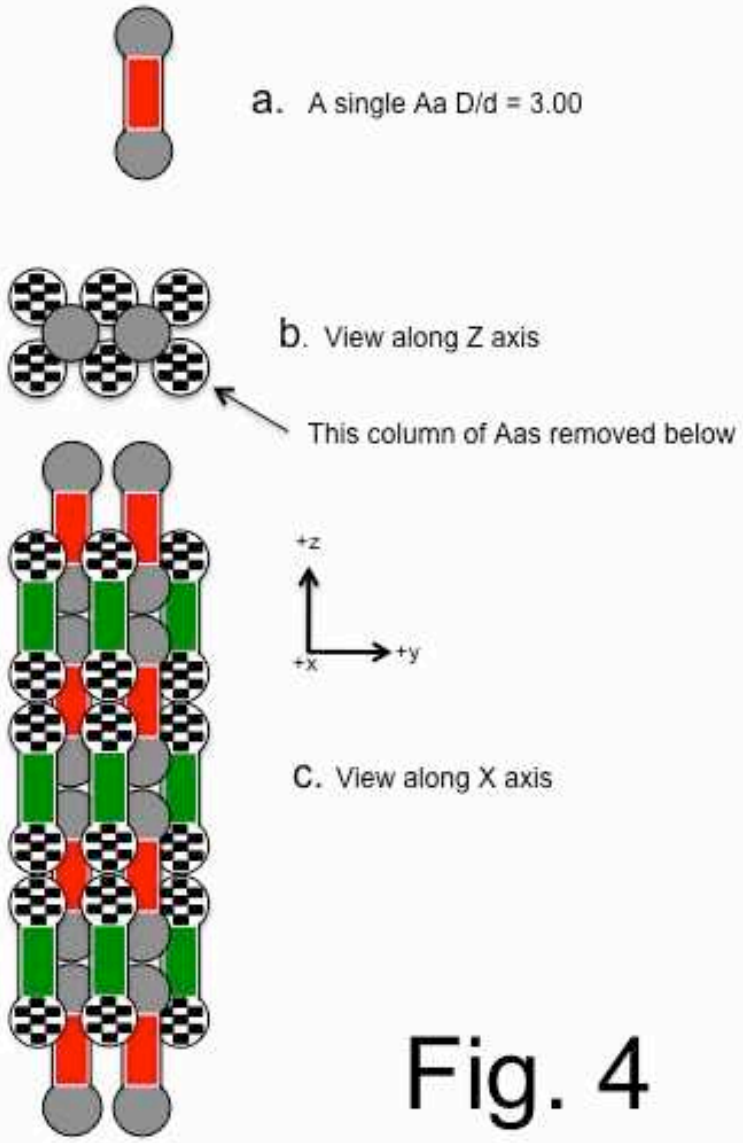


Fig. 4

2-D Section Views of Lattice components with Aa dimensions D/d=3.00

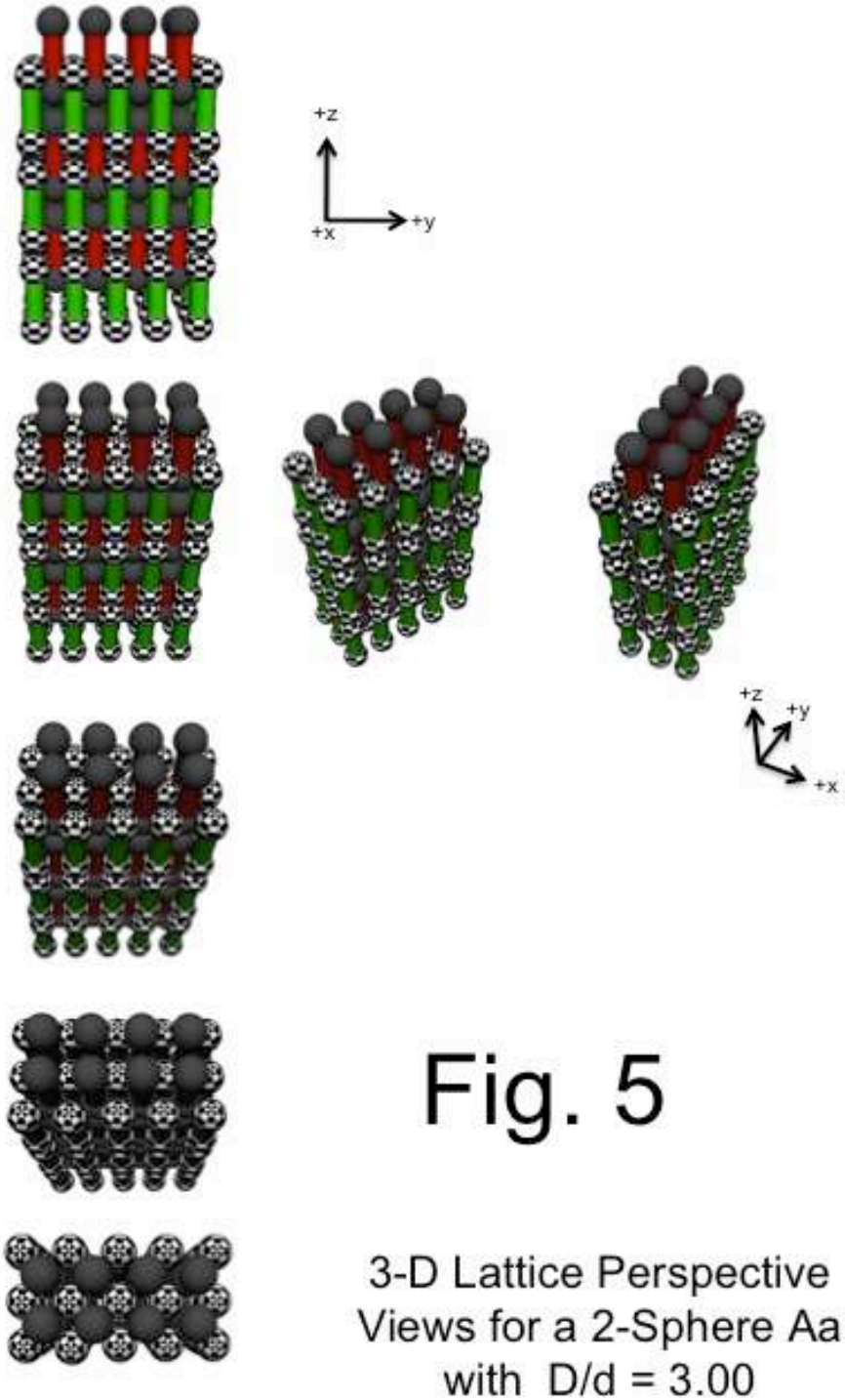


Fig. 5

3-D Lattice Perspective Views for a 2-Sphere Aa with D/d = 3.00

3.3 Theoretical SLT observation summary for the Lattice

Theoretical SLT observations for the Lattice:

1. The universe is infinite, singular, continuous, and has a simple 3-D Cartesian structure.
2. The universe is completely filled with Aas.
3. The Aas are under pressure unless they are floating in a void.
4. The Aas exhibit the material properties of elasticity and inertia similar to those we observe in tangible objects. SLT suggests that these properties do not include friction or plasticity.
5. There are NO tensile (attractive) forces in the universe.
6. The Aas form a structural scaffold throughout space which is referred to in this paper as the **Space Lattice**.
7. The Lattice structure exhibits long-range organization through the traceability of stress continuity.
8. The long-structure organization can be disrupted.
9. The Aas move within the Lattice with continuous motion in distance and velocity.
10. When the Aas come to rest, the rest locations are discrete (quantized) within the Lattice due to the geometry of their surround.

4 Matter

4.1 How a dislocation creates matter

A basic concept behind SLT is the assumption that the property called **matter** in the universe is caused, not by a tangible, physical substance, but by a very small **void.** The void is produced by **removal** of an Aa from the Lattice forming a **dislocation** in the Lattice that is **captured** within the **structure** of the physical Lattice.

The term CAPTURED is used here to mean that the structure of the Lattice surrounding a **dislocation void** remains relatively undisturbed, and the structure lines surrounding the void are fairly easy to trace into the larger Lattice structure. Much larger void phenomenon, which are considered **not-captured** by the Lattice, are discussed later in relation to cosmological events. Insertion dislocations, which are caused by the forced insertion of additional Aas into the Lattice, do not create voids. They also do not disrupt structure lines. These are discussed later in this document in relation to "antimatter".

While all the material objects we observe in physics will still be observable through the interactions they have with each other, no nano, micro or macro scale objects with hard geometric boundaries exist in SLT. There is no physical material or conventional matter associated with SLT other than the Aas. However, the Aas do **not** appear as particles nor can they be detected as physical objects at the macro scale. The Aas are **not** "**nodes**". There are no "nodes" at the point of contact of the Aas, as the term "nodes" is conventionally used in relation to Einstein's or quantum gravity theories.

A Lattice model depicting **matter** is shown in Figure 6 below. This is an extension of the front plane of the 3-D model shown at lower right in Figure 3. Figure 6-a depicts a pristine Lattice packed with identical Aas. The middle row is shaded to make it easier to visualize different Aas. The rows rise at 30 degrees from the horizontal in the figure. Figure 6-b shows the same Lattice section with a missing Aa. This is a hole or "dislocation" in the Lattice. In SLT, this occurrence creates a **particle of matter**. A "PARTICLE" is one or more dislocations that move together as a unit, remain as a stable collection over time, and exhibit an identifiable set of properties related to interactions with other particles or fields.

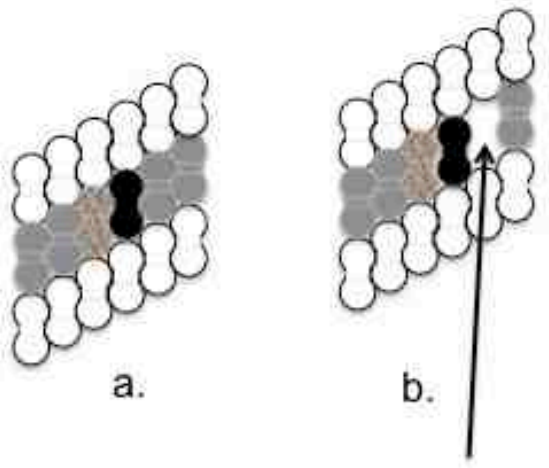


Fig. 6

Lattice showing a dislocation

A single dislocation is the smallest particle (quantum) of matter allowed in SLT. The term QUANTUM in SLT refers to a property of some phenomenon that only allows that property to exist in discrete units. The smallest observable unit is referred to as a "quantum".

Larger particles, which include the fundamental subatomic particles, and assemblies of subatomic particles to form atoms, are created by combinations of multiple dislocations. The stable subatomic particles are composed of multiple dislocations brought together into stable groupings. Once grouped, these dislocations move as a unit through the Lattice.

In SLT, the properties of a grouping of dislocations is **not** a simple sum of the properties of individual dislocations. The properties of the group are determined by how the group distorts the Lattice. The group structure is very important. To emphasize this when needed for important distinctions, the **virtual volume** of the Lattice which defines the boundary of the grouped dislocations will be referred to as a SOURCE STRUCTURE DISRUPTION VOLUME (SSDV). Protons, neutrons and electrons would be typical SSDVs.

It is important in the discussions that follow to clearly discriminate between **matter** and **mass**. MATTER is a general term for physical phenomena which occupy space and possess mass in a rest state. MASS is a property of matter that is **quantified** through measured **interactions** between matter and forces: e.g. gravity, mechanical interaction, chemical interaction and electromagnetic interaction. This is a critical distinction because, while **every occurrence** of a dislocation in the Lattice creates "**matter**", the creation of "**mass**" depends on how the dislocations organize into an SSDV and **the resulting Lattice distortion** that results from a specific SSDV. While it will be suggested later that single dislocations all have the same rest mass, the resulting "mass" of a particle is not a simple linear sum of the masses of its dislocation count. This suggests that for SLT, **conservation of mass** is **not** rigid at the subatomic scale.

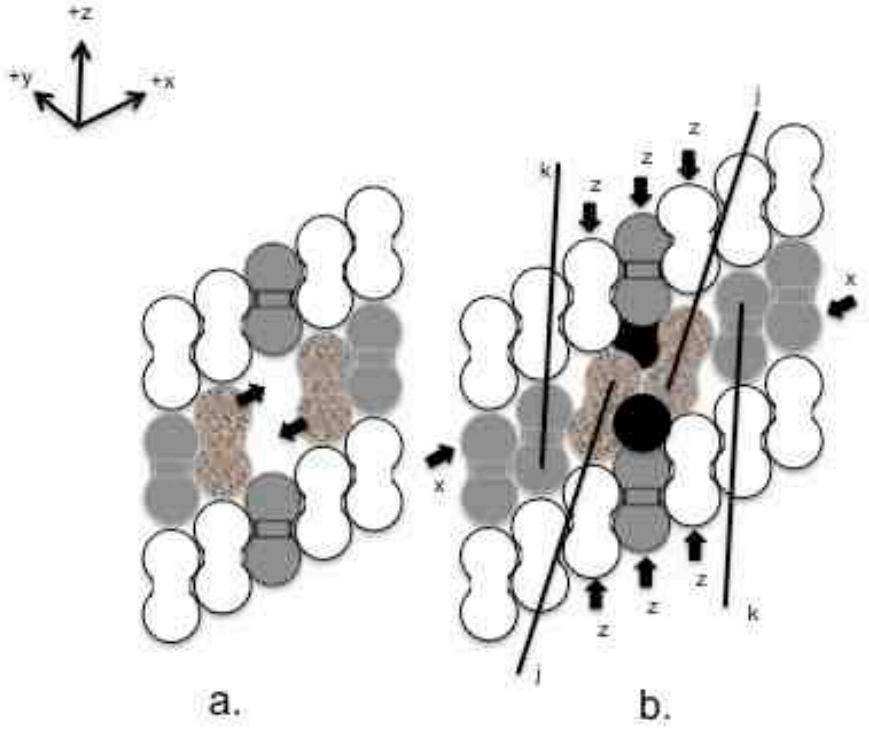


Fig. 7

Lattice response to a static dislocation

4.2 Response of the Lattice to matter

When a dislocation occurs in the Lattice, the remaining Aas in the Lattice adjust to minimize the total strain in the Lattice. A depiction of this is shown in Figure 7 above. Figure 7-a shows a small section of Lattice with one missing Aa dislocation at the center. The Aas flanking the dislocation along the X axis are speckled to highlight them. This configuration would not be stable in the Lattice. Figure 7-b shows a new arrangement that is stable after all the Aas in the vicinity of the dislocation have moved to stable orientations that minimize the total strain in the Lattice. Specifically, the flanking Aas have tilted toward the dislocation by a large amount as shown by extension lines marked j. The next flanking Aas outward from the dislocation have also tilted inward, but to a lesser degree, indicated by extension lines marked k. The next flanking Aas also tilt in because of the adjustment of the Aas closer in, as indicated by the broad arrows marked x. Theoretically, this tilting of Aas would continue along the X axis to infinity, decreasing in proportion to distance.

As all the flanking X axis Aas out to infinity tilt, space above and below them along the

Z axis opens up. So the Aas above and below the dislocation push in as indicated by the broad arrows marked z. This motion of the Z axis flanking Aas would also continue to infinity along the Z axis decreasing in proportion to distance. The same Z axis response would occur for every change of Aa that occurs along the X axis.

The black circle covering part of the lower speckled flanking Aas represents one of the spheres of an Aa out of the X-Z plane that has moved into the dislocation, causing shrinkage of the Lattice in the Y axis. This Y axis change would occur with similar continuation to infinity for every Aa change in the entire X-Z plane.

In summary, when a new dislocation occurs in the Lattice, a response occurs that spreads to infinity in all directions with magnitude decreasing in proportion to distance. That is, **any** single distortion of the Lattice at **one point** in the Lattice produces an **infinite number** of changes at **every other point** in the Lattice.

4.3 Fundamental Particles

In modern physics generally, and as described by the Standard Model specifically, science has presented a variety of basic forms of matter which are called **fundamental particles**. In SLT, FUNDAMENTAL PARTICLES are the smallest possible **stable** assemblies of dislocations which combine to produce all forms of matter. There are five **basic** fundamental particles in SLT: proton, neutron, electron, photon and neutrino. The qualifier "basic" is used here because there may be others that have not yet been discovered.

SLT does not consider concepts like quarks fundamental particles. SLT does not dispute the categorization and organization of the material forms identified in the Standard Model. However, due to the fact that these forms are not individually stable, SLT does **not** consider them **particles**. (discussed in section 13.2)

In SLT, to be stable, both complex and primitive particles must support the stable coordinated motion of dislocations through the Lattice. To do this, the collection of dislocations, which define a particular particle, must maintain their geometric relationship as they move together through the Lattice. This is a complex limitation. To achieve this, SLT suggests that **most** particles are probably not be simple spheres. If this is so, then many new "degrees of freedom" are possible in how the particles can come together. These new degrees of freedom do not require additional spatial dimensions beyond 3-D space.

4.4 Theoretical SLT observation summary for matter

How a dislocation creates matter

1. **Every void creating dislocation** in the Lattice creates **matter**.

2. Every insertion dislocation (i.e. an out-of-place additional Aa that disrupts the Lattice) creates "antimatter" (discussed later).

3. Matter, in SLT, has no hard geometric boundaries at either the nano, micro or macro scale.

4. The Aa is not a "node" as that term is used in Einstein's or quantum gravity theory.

5. A single dislocation is the smallest particle (**quantum**) of matter allowed in SLT.

Response of the Lattice to matter

6. Dislocations gather into preferred organizations or structures in the Lattice – an SSDV. The **resulting Lattice deformations** produce the property we call **mass**, as well as other properties we observe in physics.

7. **Conservation of mass** is **not** rigid at the subatomic scale.

8. Any distortion of the Lattice at one point in the Lattice produces an infinite number of changes at **every other** point in the Lattice. The amount of change decreases as a function of distance from the distortions.

9. If multiple distortions occur in the Lattice, the total response of the Lattice in the **far field** is the sum of the individual responses to individual distortions.

Fundamental Particles

10. Fundamental particles are composed of **stable** assemblies of dislocations.

11. Fundamental particles may also be composed of simpler fundamental particles.

12. Fundamental particles do not have to have spherical symmetry.

13. SLT does not dispute the particle list identified in the Standard Model. However, each particle must have a **stable** form and conform to SSDV construction limitations.

5 Time

5.1 Time

In SLT, there is **no physical reality** that can be assigned as a causal metronome which broadly and directly **clocks** the **rate** of universal interactions of matter and energy. Like the concept of a vacuum, TIME is a convenient mathematical tool for measuring the **relative rates** of interactions of matter and energy. But it has no substance of its own. Being a mathematical convenience, it may be postulated as either continuous or discrete to suit the efficiency of specific calculations. For SLT, time is always discussed as **continuous**.

The statement that time is not a physical reality in SLT is not a statement that there is nothing that acts as a regulator of the dynamics of matter and energy interactions. The physical parameters of the Aas, specifically the combination of elasticity in compression and bending, Newtonian inertia, and space Lattice geometry, constrain the **local** dynamics of the Lattice. Dynamic compression and bending in the Lattice are caused by the repositioning of Aas due to the pervasive Lattice pressure and the dynamics of dislocations. Compression and bending are stored as elastic energy in the Aas. The elastic forces try to minimize the stored stress of the Lattice. The rate that Aas rearrange is determined by the magnitude of the elastic force and the resistance to motion caused by the inertial properties of the Aas.

In simplified form, using a model whereby the Aa is a dumbbell with two ends connected by a spring, **time** is a **derived** property based on the elastic constant of the spring = k and the inertial mass of the ends = m, being of the form t ~ Sqrt (k/m).

The reaction of the Aas in the Lattice as dislocations move past them is analogous to the motion of crystals in a metal responding to a dislocation. The reaction of Aas in the Lattice to passing waves is analogous to the motion of atoms in a crystal to sound waves. The **ratio of elastic force to inertia** determines how fast dislocations and waves will move through the Lattice. Specifically, the **speed** at which these phenomena move through the Lattice is a property of the **Lattice**. It is **not** a property of the motion of the **source** or the **observer**.

SLT suggests that the dynamics of the Lattice are **not** precisely constant. As the pressure of the Lattice changes, the length dimension of the Aas will change, thereby changing their inertia in rotation perpendicular to the long axis and dynamic response.

For the case where the Lattice is ripped open to expose a void, and Aas are tumbling freely in the void, the behavior of interactions in the Lattice would no longer have meaning for those Aas. Their interaction rates would then default to a Newtonian ballistic gas model until the Lattice reclosed and they were reintegrated into the Lattice.

5.2 The Lattice Relaxation Response (LRR) and the speed of light

In SLT, the basic **rate measure** of physical interactions is called the LATTICE RELAXATION RESPONSE **(LRR)**. In a "quiet" volume of space, a wave produced by the expulsion of a dislocation from a particle would propagate through the Lattice at a speed determined by the LRR. For such a "quiet" space volume, the wave speed, referred to as the LATTICE RELAXATION CONSTANT, is equal to the speed of light "c" as is conventionally measured. In SLT, that speed is always referenced to the **physical structure** of the Lattice.

SLT suggests that there are multiple types of waves that move through the Lattice. The speeds of these waves are also determined by the LRR and move at the same speed "c".

Things move in repeatable and predictable ways because the Lattice is **mostly** uniform. The qualification "mostly" is used because distortions, like massive Lattice disruptions associated with "Big Bang" events, could significantly distort the geometry of the Lattice. Waves generated in the Lattice could expand the Lattice in some places while compressing it in others. The speed of waves moving through these differently strained Lattice volumes, on an Aa count bases, could be different. Waves traveling through two such zones, with similar Aa counts, may no longer arrive simultaneously.

5.3 The Arrow of time

The dynamics of the space Lattice explain and provide a basis for the philosophical concept we know as the **arrow of time**.

Philosophers and scientists have questioned why time always appears to move forward. Many conventional equations of physics don't require time to be unidirectional. For these equations, interactions appear to work just as well if time is entered as a negative quantity. For example, propagation equations suggest light would follow the same path going backward as it did going forward.

For SLT, there is no tangible physical property for time. Every disturbance of the Lattice can be viewed as the sum of disturbances caused by the motions of discrete Aas. Each Aa, as it moves, transfers its motion to all the Aas it touches in the 3-D space surrounding it. Each of those motion-transfers continue as an outward moving wave-shell referred to as an EXPANDING-SHELL DISCONTINUITY **(ESD)**. The ESD propagates from the initiating Aa to **infinity** in both **time** and **distance**. The magnitude of the displacement of Aas in the path of the expanding shell decreases as $1/r^2$ due to conservation of energy in the volume of the expanding shell. The shell initially approximates a spherical surface, subject to distortions from encountered masses and Lattice irregularities.

This is a behavior that can be summarized as the **creation** of a **complex infinite geometrical effect** from a **simple point cause**. It is characterized by having a **causal** disturbance expand into the geometry of an infinite volume that is unaffected by that cause prior to the arrival of the disturbing shell. That is, the volume within the expanding shell is affected by the cause, while the volume outside the shell is not affected. Furthermore, once this process is started by a **cause**, the effect on the universe is no longer under control of the cause, but is propagated by the universe itself based on the structure of the universe.

Based on this model, there is **no** physical way to "create", that is, intentionally set up, a starting pattern of matter and energy that will cause the reverse process. There are three reasons: **entropy**, the **Expanding-Shell Discontinuity (ESD),** and **infinity.**

A "first thought" approach for a "**reverse physics**" experiment might be to set into motion an **inwardly collapsing spherical shell** that, when it reaches a single point, makes a particle of mass at that point disappear. This is the reverse of a particle of mass appearing and launching a gravity wave into the universe.

Our “first thought” approach would be to set up a starting shell of matter and energy in which the location, velocity and direction of **all** of the Aas in that shell are started with infinitesimally small motions, and precisely aimed directions at precisely the right synchronization. This approach expects that when all of the waves from all of those Aas come together, one specific Aa will disappear. This approach would fail for a critical reason.

In this reversed time universe, the physical properties of the universe could **not** be the same as in a forward time universe. If they were, we would actually just be running a “forward time” universe using different initial conditions. For a reverse time universe to work, **all** the physics concepts must be reversed as well: gasses move from diverse low pressure geometries to concentrated high pressure geometries; energy moves from two cold bodies of equal temperature in contact, preferentially, to one of them making one hotter and one colder; when a saw cutting wood is run, dust chips scattered around, come together and assemble themselves using a reverse rotating blade to join together two precisely spaced pieces of wood with grain structure matching the joined pieces.

In a forward time universe, physics is a process of numerous repeats of fairly simple rules which produce complex results. In a reverse time universe, the physics rules must be infinitely complex, each taking into account the full complexity of universal history, and applying those rules to an infinity of elements in order to achieve uniquely simple results. There is no philosophical or scientific approach that allows us to model or even understand such a reverse time universe.

If forward physics was used for the “reverse physics” experiment, there would be no way to create the initial motions applied to Aas in the form of a shell at infinity. Any attempt to produce an increased pressure wave in the direction of motion of the starting Aas would also create a decreased pressure wave moving outward in the opposite direction. Second, to overcome this obstacle, the starting conditions would have to be initiated at infinite distance, with infinitesimally small motions (i.e. zero displacement), at an infinitely earlier time. I don’t believe we mathematically or philosophically even know how to comprehend such a process.

To summarize this point, reversing the Arrow of Time fails for 3 reasons:

1. There is no reverse process for **entropy** in the Lattice.

2. The concept of an **Expanding-Shell Discontinuity** requires that, if the process that underlies entropy could be envisioned in reverse, a second process must also occur whereby a Lattice healing "reverse discontinuity" occurs. That is, on initiation of a self generating event organization, not only must the infinity of objects defining the inward moving shell be "programmed" for motion, but they must be programmed with knowledge of the state of the entire volume of space within the shell so that the aftermath of the inwardly passing shell discontinuity will leave the Lattice in a healed state. This healed state is not a simple smooth Lattice either. The healed state must appear to be disturbed by the presence of all the masses in the universe **except** the mass which is the target of the shell.

3. The concept of **infinity** requires that the processes described in reasons 1 and 2 must also address that the initiating shell be started at an infinite distance. That requires the "programming" of an infinite number of objects with infinitesimally small motions. But, in addition, while these infinite number of objects are at infinity, they have to focus precisely on an **absolute location** in a spatial volume that by it's property of infinite dimension, has no basis for defining an absolute location. To achieve this, the concept of infinity itself must be redefined.

5.4 Cause and Effect

The principle of **Cause and Effect** emerges directly from the concept of the Arrow of Time. Interactions of matter in space are the repetitive process of strong, simple, unique events creating weaker, complex, infinitely diverse events. **No** events in the universe are spontaneous, including radioactive decay.

5.5 Entropy

The concept of ENTROPY in SLT is a thermodynamic principle that results from the concept of cause and effect. It explains that, for every event that disturbs the Lattice,

energy will be lost to the Lattice through a diffusing process of strong, discrete, simple events creating infinitely diverse, infinitesimally small, **complex** results.

No known physics can explain how, in a diverse collection of similar simple objects, a **self directed** organization of a large number of the objects, starting with infinitesimally small object motions can occur to bring the energy of those motions together to create a strong single simple event. This does not reject the possibility of random occurrences of waves in the Lattice combining to produce unusually large energy concentrations at some points. Some of these may be large enough to cause disruptions of the Lattice.

5.6 Time travel

SLT suggests that there is no physical reality that can be assigned as a causal metronome which regulates the rate of universal interactions. What we call time is simply the unfolding of events in relation to the dynamic response of the Lattice (the LRR). There is no natural mechanism in SLT that can record the time sequence of any physical event, much less, the synchronized time sequence of every particle and wave interaction in the universe. Without such a recording, there is no way for an observer to reconstruct the past. The universe is essentially a massively parallel analog computer that is continuously computing, in "real time", the relative location and motion of Aas as they interact with each other. The universe is a "real time display" of the current result. Replaying such a record would require a computer as vast and fast as the universe itself. So, claiming no mechanism for storing a historical record, nor parallel universes to play back such a record, even without considering the ability of some human individual or tangible machine to control such a process, SLT does not support the concept of time travel.

5.7 Sustainability of the universe

The description of the Arrow of Time and the continuous degradation of high energy states through the process of entropy raises the question of universe sustainability. These two principles, if followed to their conclusion, suggest a universe in a state of "dead", uniform, motionless Lattice. But this view is misleading because these principles only look at one part of the Lattice process. For matter to exist at all, at least

one energizing event had to occur to establish the mass that the decay process would degrade. If there were one such event, why couldn't there be more?

SLT does suggest an energizing process: a "Big Bang". In fact, SLT suggests that Big Bang events occur frequently – on cosmic time scales. This is discussed in the section titled Special Issues In Cosmology.

5.8 Theoretical SLT observation summary for time

1. Time is not a physical reality. The dynamics of the Lattice are determined by the elastic and Newtonian inertial properties of the Aas and the geometry of the Lattice. Events in the Lattice therefore occur over **relatively** repeatable periods. But the dynamics of the Aas can vary locally under changes of Lattice stress.

2. The rate of all motions and interactions in the Lattice are regulated by the **Lattice Relaxation Response (LRR)**. The LRR determines the maximum speed Lattice disturbance can propagate at. This is called the **Lattice relaxation constant**, which is equal to the speed of light "c".

3. Time is a **derived** property based on the LRR. For SLT, time is treated as a **continuous** property.

4. Time (The Arrow of Time) is always observed to move "forward". For every disturbance process in the Lattice, which occurs at some "discrete" instant and location, direct mechanical forces between Aas convert the original disturbance into and outgoing wave of related motions and energy disturbances that eventually reach **all** the Aas in the universe out to **infinity** in both distance and time.

5. Every disturbance in the Lattice launches an **Expanding-Shell Discontinuity (ESD)** into the Lattice. The volume within the expanding shell records the changes induced by the cause, while the volume outside the shell is not affected until the ESD passes.

6. The ESD principle can be summarized as the **creation** of a **complex infinite geometrical effect** from a **simple point cause**.

7. There is **no** known theoretical way to create a starting pattern of matter and energy that can exactly reverse the process of the ESD in the Lattice.

8. Cause and effect, plus the ESD are the foundation for **Entropy**.

9. The principle of **Cause and Effect** emerges directly from the concept of the Arrow of Time.

10. Entropy is a thermodynamic principle that results from the concept of cause and effect whereby energy will be lost to the Lattice through a diffusing process of strong, discrete, simple events creating infinitely diverse, infinitesimally small, **complex** results.

11. Because there are no conceivable mechanisms to record the history of the universe, nor play such a history back, SLT does not support the concept of time travel.

12. The universe is a sustained phenomena because it cycles energy continuously between mass creation events (Big Bangs) and energy dissipation through entropy.

6 Dynamics of Matter

6.1 Movement of matter through space

For matter to move through the Lattice, both single dislocations and structured collections of dislocations, which make up more complex particles, must be able to **move** through the Lattice while maintaining their structure.

Dislocation physics, in various forms, are a well known phenomenon in solid materials. One example is the flow of electrons through conductors. Electric current is well understood as the "flow" of electrons. However, in order for electrons to move from a negative to a positive terminal through a solid conductor, many intermediate steps occur. A length of wire is depicted in Figure 8 below connecting positive (+) and negative (-) terminals. In the figure, the capital letters (A, B, C etc.) depict individual atoms. The lower case letters "e" represent electrons.

To create an electric current, an electron in the wire near the (+) terminal responds to the electric field in the wire induced by a voltage potential between the (+) and (-) terminals. The electron jumps out of its atom (A) (electrons are associated with the letter to their right in the diagram) into an atom in the (+) terminal (not shown). This action is shown in Figure 8-b. The arrow shows the motion of the leaving electron. This leaves atom (A) missing an electron. In electronics and solid state terminology, this is referred to as a **hole**. An electron on the adjacent atom toward the (-) terminal, (B), which is also subject to the electric field of the poles, jumps toward the (+) terminal into the hole in atom (A). This leaves a new hole in (B) (Figure 8-c). This process continues until all the electrons in a line from the (+) terminal to the (-) terminal move **one** atomic spacing toward the (+) terminal (Figure 8-b through e). Finally, an electron from the (-) terminal jumps into atom (J) returning the wire to the original starting condition (Figure 8-a).

Over all, a large quantity of electrons have each moved a single atom step toward the (+) terminal. But, most important for this example, a **non-entity**, one virtual "hole", is first created in the wire out of **nothing**, and then appears to move all the way from the (+) terminal to the (-) terminal where it disappears from the wire.

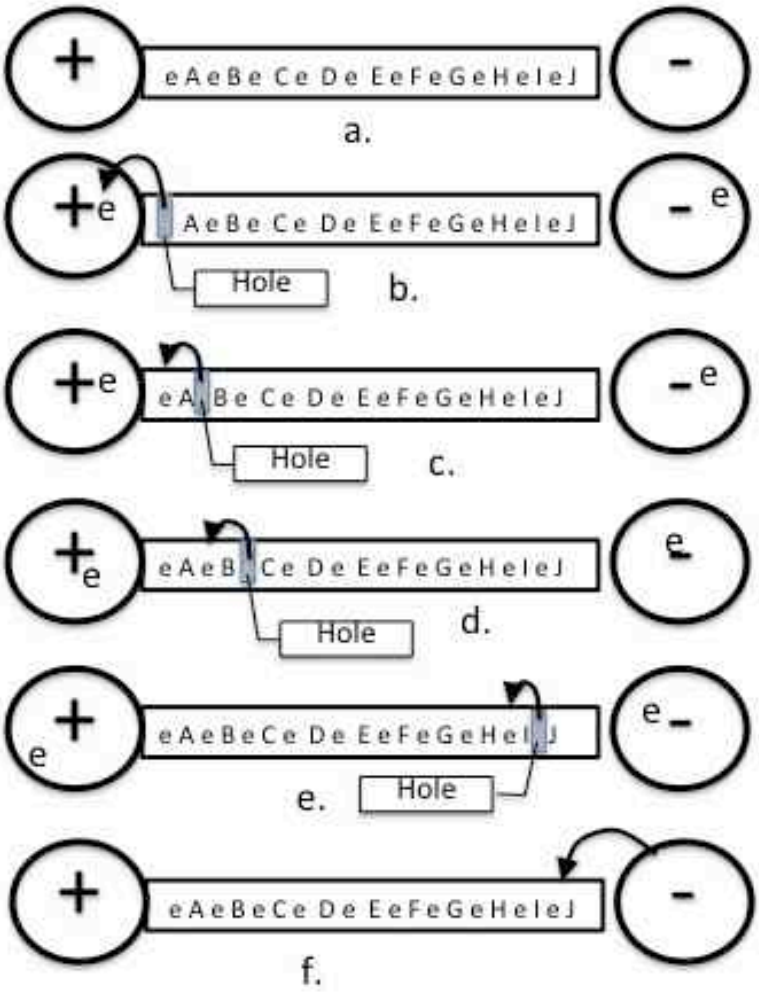


Fig. 8

Electron Hole movement in a wire

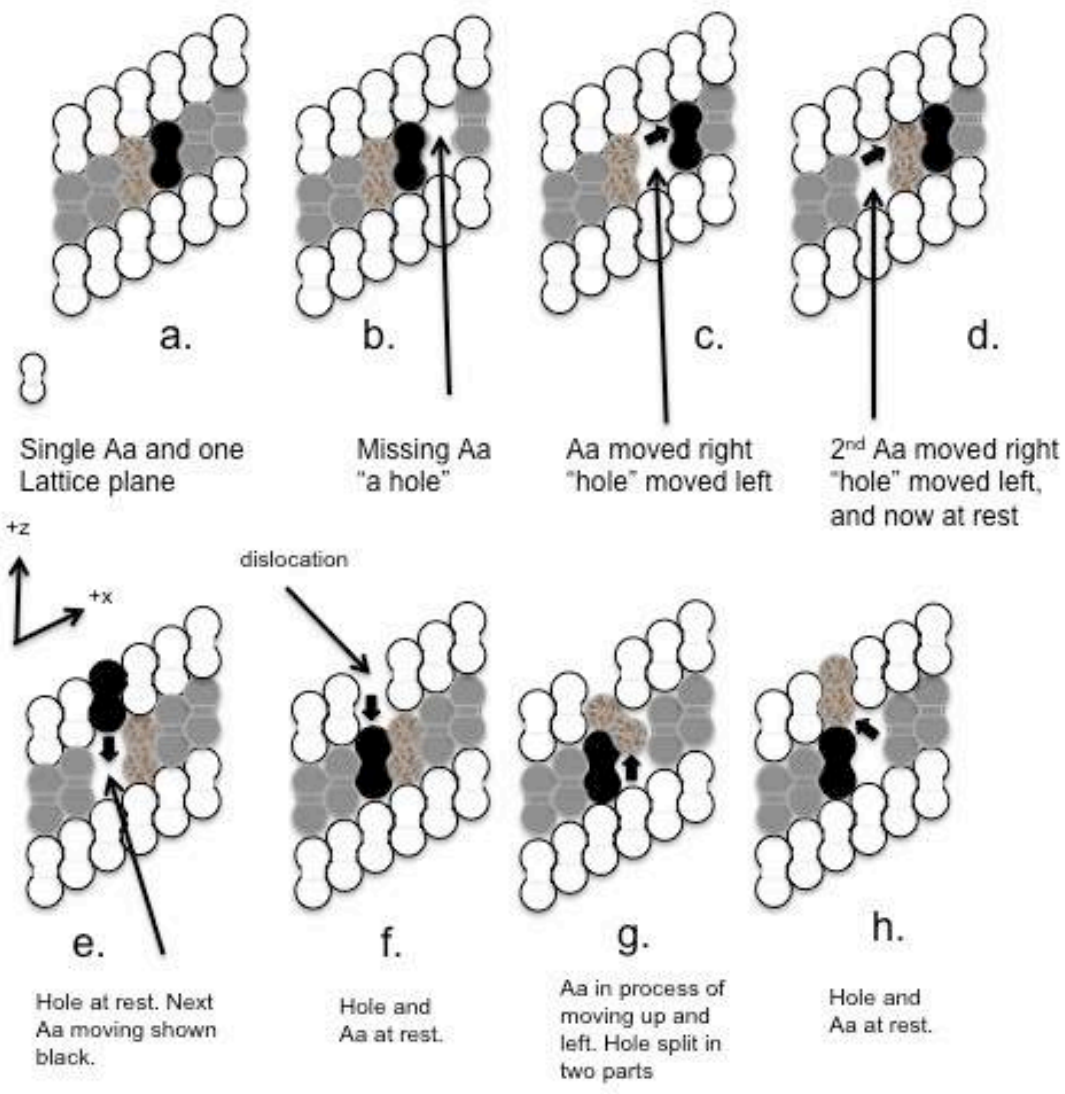


Fig. 9

Time sequence showing dislocation (hole) movement.

In SLT, the Aas transport **matter** through a Lattice made up of Aas in a fashion similar to the flow of "holes" and electrons in a wire.

A small section of Lattice without any matter present is depicted in Figure 9-a above. One line of Aas is shaded to make it easier to track the motion of individual Aas. In Figure 9-b , one Aa has been removed. This creates a hole or "dislocation", which SLT suggests creates the phenomenon we know as **matter**, in that location of the Lattice. In Figure 9- c, an arrow shows how the black Aa could move to the right (+x axis), one Lattice space. That move would fill the dislocation created by the Aa removed in Figure 9-b, and simultaneously create a new dislocation at the location from which it came. The process could repeat, moving the speckled Aa right, while the "dislocation" moves left. The result (Figure 9- d) is that the "virtual" mass, the original missing Aa in Figure 9-b has moved through space coming to rest 2 Aa widths to the left (-x).

Figure 9-e and f show the process of motion in a (z) direction. The black Aa moves down causing the dislocation to move **up** one Lattice increment in Figure 9-f. A cross axis move is shown in Figures 9-g and h.

Note, as in the electric wire example, the dislocation can move many steps while many Aas each move only one step.

6.2 Inertia and inertial mass

One property associated with **matter** we call **inertia**. This property, as described by Newton, causes matter to stay at rest until a **force** acts on it to put it in motion. Once in motion, the matter continues to move at a constant rate in a straight line until another force changes that motion. In calculations that measure the relationship of changing motion and forces, we use the classical equation F=ma where "F" equals force, "m" equals mass and "a" equals acceleration. In classical Newtonian physics, the characteristic motions of matter are considered an inherent **ballistic** property of matter. That is, **inertial behavior** is assumed to be an inherent property of matter moving through a void. SLT does **not** support this model for **matter** as defined in SLT.

Using wave motion in the ocean as an analogy, for a wave to move, water on the trailing part of the wave falls, creating a pressure that pushes the water up on the forward part of the wave. SLT suggests that the motion of **matter** through the Lattice, which is what we call Newtonian motion, is caused by a similar principle. When a dislocation moves through the Lattice, a moving 3 dimensional **distortion** of the Aas in the Lattice surrounds the dislocation and causes it to continue its motion. When a dislocation is at rest, a force is needed to create the distortion in the Lattice to move the dislocation. The conventional Newtonian equations of motion, i.e. F=ma, are appropriate in SLT for slowly moving objects.

SLT suggests it is the dynamic response of the Lattice to the presence of dislocation structures and their movement that creates the property of **inertia** that we associate with **matter**. In other words, moving matter is accompanied by a **propelling** "wave-field" of Aas surrounding the matter. The shape of the wave is maintained by the **kinetic** response of the Aas and the "Newtonian" **inertia** of the Aas.

Specifically, SLT suggests that the **inertia** of **matter** is an **indirect** property of the Lattice. The inertia of matter is due to the kinetic motion of the Aas in the Lattice in the form of a complex wave function in which the Aas are moving in many directions, not just in the direction that the matter is moving. (This is discussed further in the section on gravity.) The wave motion creates an **inertial field** for **matter**.

Given this indirect field model of inertia, the reason objects at rest stay at rest, is that the Aa field surrounding their dislocations is not structured to propel them. The reason objects set in motion continue to move in straight lines at the "same speed" is because they are riding a wave field in the Aas of the Lattice surrounding their dislocations. In order to accelerate matter, additional force is needed to increase the wave field kinetic energy. A greater force is needed to accelerate larger quantities of matter, in **direct proportion** to **mass**, because additional field has to be created to support the dislocation arrangement that defines the mass.

Importantly, expanding on the wave-field concept of inertia, SLT provides a functional description for **inertial mass**. SLT suggests that **inertial mass** is **not** a simple sum of Aas, nor a sum of dislocations. "Inertial mass" is a functional result of the Aa field

distortion that needs to occur in the Lattice, for any individual construction of matter, to move that matter through the Lattice.

The property of inertial mass that is called **momentum**, is therefore not proportional to a simple count of dislocations, but a measure of the forces which need to be applied to a Source Structure Disruption Volume (SSDV), i.e. mass, to make it accelerate at a specific rate. The momentum is also a measure of the kinetic energy accumulated in the field moving the mass. And that momentum can be directly described as a vector in space relative to the Lattice.

To reiterate a fundamental point related to Newtonian inertia, SLT does **not** state that inherent "pure" Newtonian inertial behavior in space is no where valid. SLT suggests that such a behavior does exist, but applies only to individual Aas. The inertia we associate with tangible matter is **not** an inherent property of that matter, but an indirect inertia, due to the kinetic energy of the Aa wave-field propelling the dislocations which define the matter, which is in turn a function of the "mass" and elastic properties of the Aas and their geometry in the Lattice.

6.3 Theoretical SLT observation summary for the dynamics of matter

1. For SLT, the phenomenon of matter is caused by the dislocation of Aas in the Lattice.

2. The motion of matter through the Lattice can be much greater than the motion of individual Aas in the Lattice.

3. The aggregate motion of Aas in the Lattice is opposite to the motion of matter.

4. Dislocations can move in all directions through the Lattice.

5. Dislocations can come to rest in the Lattice.

6. Dislocations only move in the Lattice when forces, due to **stress** in the Lattice, move them.

7. The only forces in the universe that affect the motion of matter are **positive** stress distributions in the Lattice.

8. The "classical" **Newtonian inertia** physics associates with **matter** is **not** a ballistic property of matter as suggested by Newton, but rather the response of dislocations to the dynamic mechanical field energy of Aas in the Lattice.

9. Objects at rest do not move because they are restrained in the Lattice by the inertia of the Aas. Objects in motion, which are not being accelerated by a force, continue to move at approximately constant speed, due to the kinetic energy field of Aas acting as a wave.

10. The conventional Newtonian equations of motion, i.e. F=ma, are appropriate in SLT for slowly moving objects.

11. Individual Aas retain the ballistic inertial properties of mass, inertia and elasticity as assumed in Newtonian physics.

12. Momentum and inertia are **proportional** to mass because a field must be built for each SSDV which defines its **mass**.

7 Photons

7.1 Photon construction

Photons are **key components** of the universe. They play a **major role** in SLT. SLT suggests a very simple model for how photons work. Yet this simple model suggests profound answers to many "unanswered" questions in physics.

SLT suggests that a PHOTON is the combination of: a.) a **single removal Aa dislocation** in the Lattice, which is not part of a more complex stable particle; and b.) an accompanying **pulse envelope**.

The term PULSE, in this usage, means a dynamic adjustment of Aas in the Lattice that move through the Lattice as a group like a **single period** wave moves across a water surface. A pulse can be quantified generally by: magnitude, velocity, width, and shape. The shape can take many forms, varying in all 3 spatial dimensions. However symmetries are constrained by the velocity vector.

Importantly, SLT suggests that photon energy is **not** a **periodic wave**. A WAVE, in SLT, is a periodic geometric disturbance of the elements of a substance that may be propagated without net movement of the elements, in which the periodic nature is characterized by **multiple repeats** of a similar disturbance geometry. A pulse, is easily confused with a wave because it produces the effects of a **single period** wave-like disturbance.

SLT suggests that photons may exist either as stationary objects, for which their pulse energy is zero, or propagate through the Lattice as discussed in following sections. The physical shape of a photon is determined by the dynamic Lattice response to both the missing space of the dislocation and the pulse distortion field. This shape is **not** spherical except for stationary photons.

7.2 Photon creation

A photon is typically created when a single dislocation in a basic sub-atomic particle or electron shell, gets **ejected**. The ejection occurs when an Aa from the Lattice jumps into a particle and fills an existing dislocation. The jump of the Aa into the particle **launches** a moving dislocation (hole) and its propelling **pulse** into the Lattice.

SLT suggests a detailed cause and effect process for the ejection of a photon. The ejection results from an **interaction** between the particle that ejects the photon and the surrounding Lattice. Specifically, photons are ejected by particles through a process that has the following steps.

A force field must arise near the periphery of an SSDV (particle). This might be caused by a collision with another particle for example. The force field must be a "mechanical stress field" near the periphery of the particle which simultaneously reduces the Lattice pressure inside the SSDV and increases the Lattice pressure in the immediate vicinity outside of the SSDV. This will force an Aa under pressure from the Lattice to jump into a reduced pressure dislocation in the Lattice inside the SSDV. A functional depiction of such a case is shown in Figure 10 below.

Figure 10 shows a representation of the Lattice as a 2-D Cartesian grid for simplicity of explanation. Only the vertical segments of the grid are Aas. Figure 10-a shows a dislocation at rest which is just one component of a larger arrangement of dislocations that comprise the "particle".

In Figure 10-b, a reduction of pressure in the Lattice **inside** the particle around the dislocation has reduced the Lattice strain around the dislocation. These changes might be part of a nuclear decay process. An Aa one Lattice spacing to the left of the dislocation is highlighted for reference. If the **compressive** stress in the region of the highlighted Aa adjacent to a dislocation in the particle becomes sufficiently high and the inward strain around the dislocation is sufficiently **reduced**, this combination can move the Aa from outside the particle to fill the dislocation inside the particle. The result is shown in Figure 10-c. As the highlighted Aa moves into the particle, a new dislocation is formed in its former place.

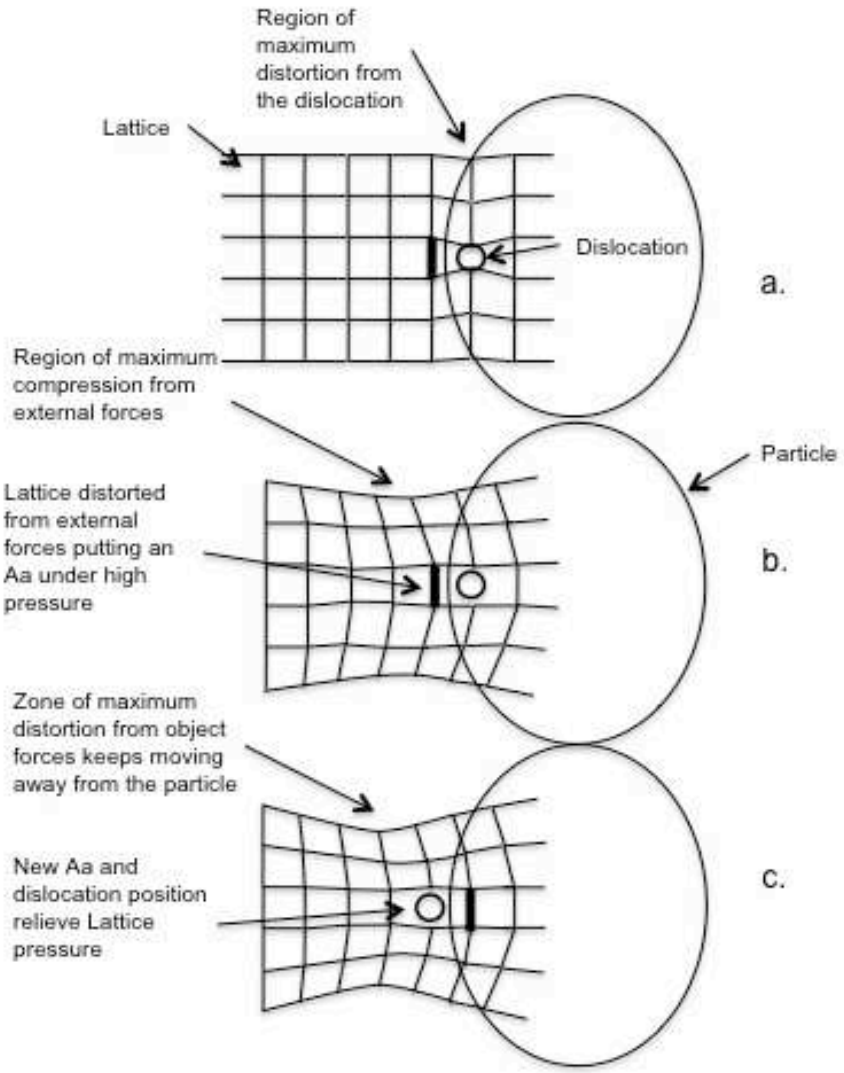


Fig. 10

Matter ejecting a photon

The creation of the dislocation triggers a repeat of the process that ejected the dislocation in the first place. The pressure in the region formerly occupied by the highlighted Aa drops. The surrounding Aas move inward until they are stopped by new "mechanical" contacts. The Aas are then compressed by the water hammer effect of the surrounding Lattice. This causes them to rebound creating a new area of reduced strain. This acts as a re-triggering mechanism to repeat the dynamics of the prior dislocation jump. Continuing repetition of this dynamic propels the dislocation and pulse through the Lattice. This process is what we observe as "photon launch".

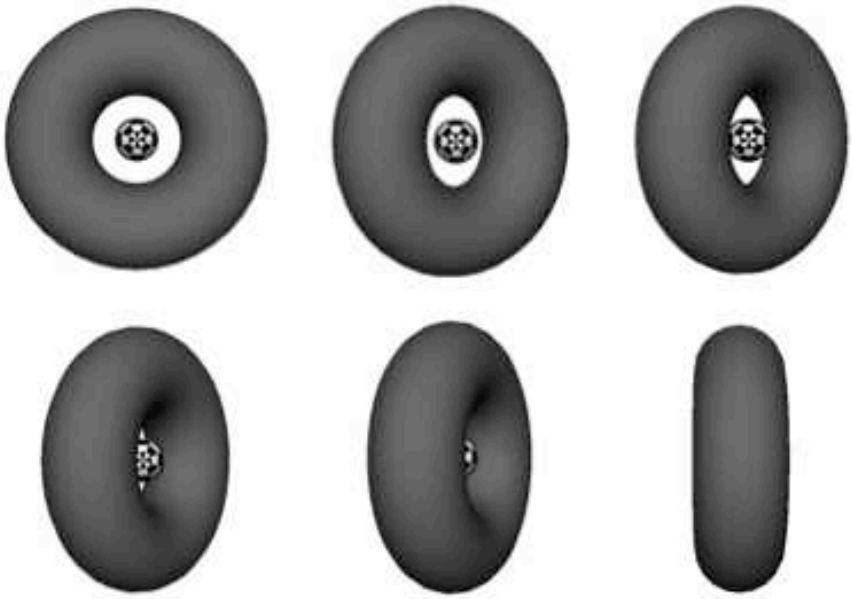
7.3 Photon matter, mass and energy

Since an ejected dislocation (hole) is a void in the Lattice, the photon carries the property we call **matter** because it will affect the shape of the Lattice. As will be discussed later, the matter associated with the photon will functionally affect the Lattice in a way that causes the property we observe as mass. Thus, photons will be observed to "carry" **mass** and their interactions will be observed to act like **mass carrying particles**.

The energy carried by a photon in motion is the energy of the pulse envelope that propels it. The photon pulse envelope is a "mechanical" stress–strain disturbance in the Lattice (not a polarized electrical phenomenon) which accompanies and drives a photon dislocation as it moves. If a photon comes to rest, its pulse envelope has somehow been dissipated and no longer exists.

The photon pulse envelope is a dynamic disturbance in the Lattice, which can be described by wave mechanics, that travels through the Lattice centered around its dislocation. The disturbance is the sum of the motions of Aas in the Lattice which propel the dislocation through the Lattice.

SLT suggests that the photon pulse disturbance can be functionally visualized as a **moving toroidal wave** centered radially on the dislocation, similar in shape to a smoke ring. A pictorial representation of the toroidal wave is shown in Figure 11 below.



Photon shown starting top left at 0, 35, 45, 55, 65, and 90 degrees rotation from line of travel.

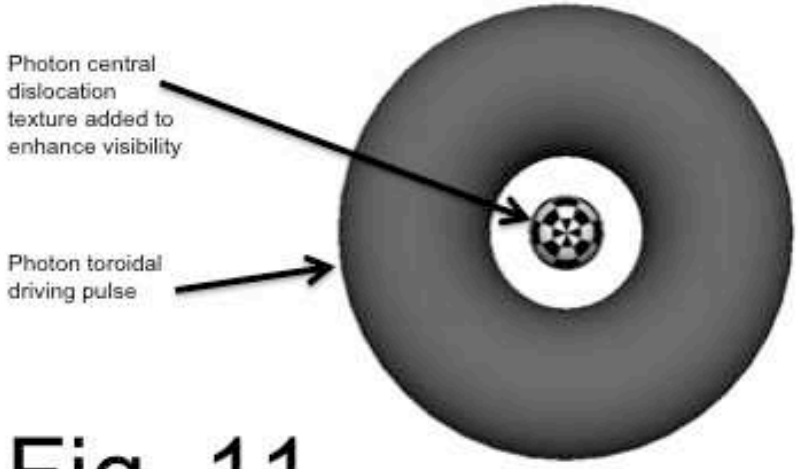


Fig. 11

Photon showing central dislocation and toroidal wave

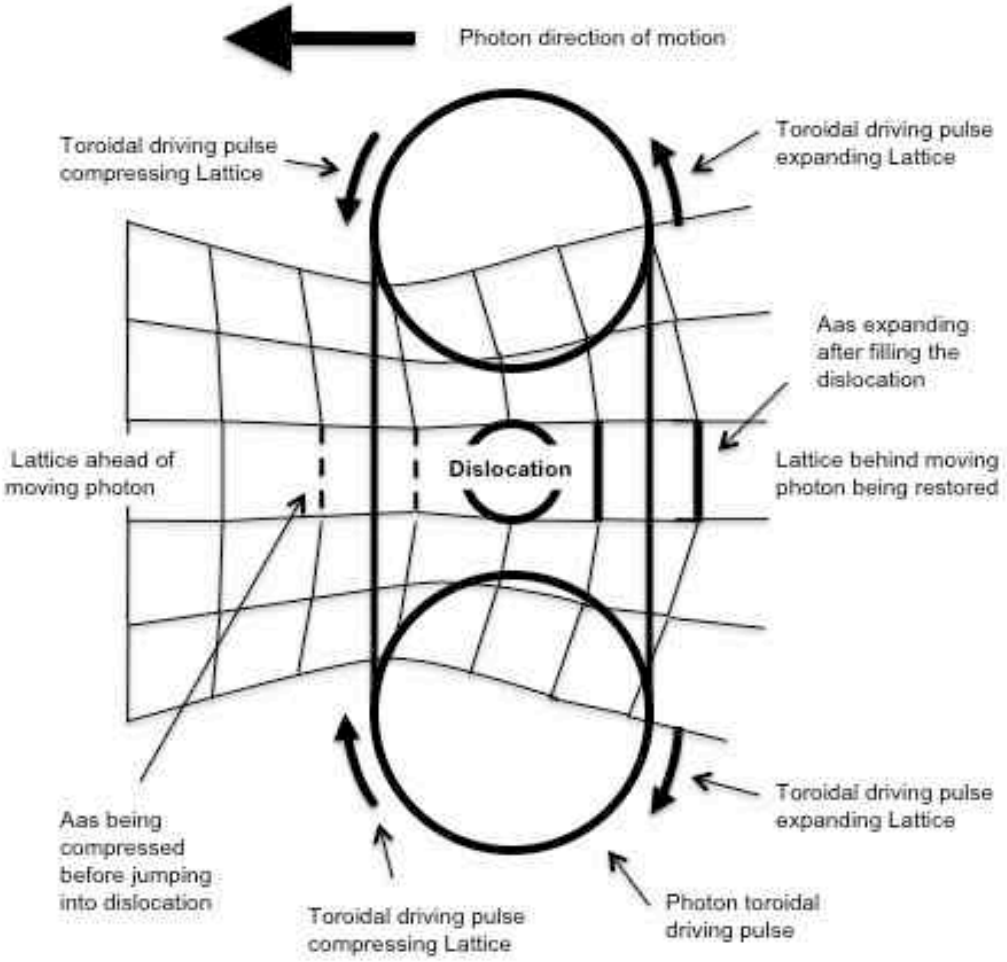


Fig. 12

Photon showing central dislocation and toroidal wave – section view

Figure 12 above shows a functional representation section view of a toroid with a dislocation at its center. The toroid section represents an iso-surface of the relative velocity of Aa motion as the toroidal wave moves through the Lattice. That is, SLT suggests that the wave shape of a photon is **not** spherical, but toroid shaped. The wave would roll so that the leading surface is moving inwards toward the axis of the toroid, and the trailing edge is moving outward, away from the axis. The inward motion of Aas at the forward end creates compressed Aas as it passes. When the compression is high enough, the Aa closest to the dislocation jumps in to fill it. The dislocation has then moved one Lattice unit forward. The outward motion of Aas at the trailing end allow the compressed Aas to expand an revert to the static parameters of the Lattice. The inertial expansion rebound of the Aas at the trailing edge help sustain the wave.

The size of the pulse envelope is many times the size of an Aa. Its size is related to the energy of the photon. The combination of pulse envelope size and the pressure differential between the forward and trailing cylindrical volumes determines the energy of the photon. The pulse's effect on the Lattice extends to infinity, but not in a $1/r^2$ form common of field structures. A pulse structure is much more confined.

The location of the axially centered dislocation does not have to be at the crossection center of the toroidal wave. For a photon moving near the speed "c" in the Lattice, the dislocation may lag the toroid substantially and the wave shape may depart substantially from a pure toroid.

The inward tumbling edge of the toroid leads the way into prevailing Lattice. The ability of the Aas it encounters to respond to the pulse are determined by the LRR.

7.4 Photon particle–wave duality

The SLT photon model suggests a simple explanation for photon **particle–wave** duality. SLT suggests that photons behave as "particles", because they carry mass. But they also exhibit "wave-like" properties, in the form of a "single disturbance wave", because their driving pulse, which is a mechanical property, not an electromagnetic property, can deposit energy. Because the photon carries both mass and wave-like properties, measurement processes designed to recognize these properties will find them.

Specifically, SLT suggests that photons can produce responses in appropriate detectors that appear to have **energies** over the entire "electromagnetic spectrum" from ultra high, as in X-rays and gamma rays, to zero, as in the detection of mass at rest. Detectors that interpret energy as wavelength would produce wavelength measurements accordingly. However, those detectors that rely on dislocation capture using known materials in conventional applications would be limited to wavelengths above the ULTRAVIOLET THRESHOLD because photons with lower energy are no longer able to dissociate electrons from atoms. A photon moving in the Lattice is not fundamentally different from a dislocation at rest in a particle. What makes the photon dislocation appear different from a stationary dislocation is that it is both moving and accompanied by the **dynamic pulse field.** To be "observed**",** a moving dislocation must be measured using different parameters and different methods for each range of the electromagnetic spectrum.

Stationary dislocations are currently only measured through mass or inertia measurements. These are indirect measurements because existing mass and inertia measurements can only measure down to the scale of the SSDV. Attempts to measure stationary dislocations has not yet been attempted because this phenomenon has not been suggested in physics prior to this document. Stationary dislocations have also not been accidently measured alone in conventional matter because, to form objects, multiple dislocations must form structured groups in sufficient quantity. Mass and inertia measurements are then done by applying a force to objects to produce motions, and the motion of the objects observed.

Moving dislocations in the form of photons, on the other hand, are measured with many properties: energy, speed, direction of motion, polarization, Zeeman magnetics etc. in addition to inertia and mass. Most of these measures, however, are made indirectly through interactions caused by bringing the photon to a stop. Measurements can be made without stopping the photon through observing deflection in the path of travel. However, even in the deflection case, photons being deflected are measured by eventual collisions with matter or complete **capture** by matter to determine the angle of deflection.

Therefore, measurements designed to observe photon **particle properties** will find them due to the compact shape of the photon pulse, the discrete Lattice disrupting effect of its central dislocation, and the gravitational effect of its mass. Measurements designed to confirm photon **wave properties** through the inference of the relationship of wavelength to energy, e=hv, will find it from the energy content of the pulse in the response of detectors to the photon pulse energy as it is captured.

While SLT suggests a simple mechanism to resolve the particle-wave duality problem for photons, it also introduces a complication to all Lattice vibrational measurement. SLT suggests that the wavelength of **all** vibration types in the Lattice, i.e. electronic, magnetic or mechanical, can appear **throughout** the full Lattice permitted spectrum, which is the entire range of wavelengths and vibrational rates that the Lattice can support without disruption. Long wavelength phenomenon, typically referred to as microwaves and radio waves, can also be produced by photons. Short wavelength phenomenon can also include mechanical and wave vibrations. However, the non-photon wave forms are incapable of transferring matter.

7.5 Photons, matter–energy conversion, and the nature of light

Matter-energy conversion

The SLT photon model suggests a simple explanation for the **conversion of matter to energy and energy to matter**.

A photon is created when a dislocation is ejected into the Lattice from a particle. The photon will carry two forms of energy with it. Prior to an ejection event, the Lattice distortion inside the particle that creates the dislocation is associated with **reduced** potential energy due to the relaxation of the Lattice into the dislocation's void. This energy reduction is the **gravitational energy** associated with the dislocation's **rest mass**. To eject the dislocation, additional stress energy must be provided from some energetic event, which removes stress from the Aas around the void so they can move outwards to allow an new Aa to come in. Increased energy must also be added external to the particle near the dislocation to put the Aas there under pressure to force an external Aa from the Lattice to fill the void.

Observing the whole process, one can visualize a toroidal wave of stress-strain energy being ejected from inside the particle along with the dislocation. The amount of energy involved with this process is variable and creates the photon's kinetic energy. The effect on the Lattice shape of the dislocation itself, which extends to infinity, creates the dislocation's gravity field and its mass value "m". The ratio of the Lattice relaxation energy to the photon's mass effect is $E = m c^2$.

While this familiar equation is presented as a linear function of the quantity of mass involved, SLT suggests that the relationship will not hold if the mass density becomes extreme and the Lattice structure distortions become discontinuous. This will apply to cases such as black holes.

Since the ejected **dislocation** was the cause of **matter** and **mass** in the particle before ejection, the particle loses matter and mass during the ejection. When that moving photon later encounters a condition that can "trap" it, one of which is a collision with matter when the photon energy state is appropriate for capture, the dislocation is added to the capturing matter, increasing its mass. This addition of a dislocation allows the Lattice to squeeze in, and is thereby accompanied by a reduction of the gravitational field energy of the capturing matter in proportion to the rest mass of the photon. The photon energy pulse will contribute additional energy in the process in the form of pulse energy effects. Depending on the magnitude of the pulse energy, additional ejections may be caused or the energy may be dissipated as thermal or electromagnetic wave energy.

It should be noted that the photon's disturbance of the Lattice, referred to here as the dislocation and pulse, actually extend outward from the dislocation into Lattice to infinity, with a magnitude that decreases with distance. But because of the geometry of the pulse toroid, and its ability to restore the Lattice as it passes, the effect of photon passage on the Lattice is **small**. However, "small" does not mean zero. This implies that photon passage is accompanied by energy loss. This will be discussed later in relation to "red shift".

Also, while SLT suggests that photons can decay to zero pulse energy, it also suggests that there may be a theoretical upper energy limit. If the pressure differential or the

edge motions of the toroidal pulse are severe enough to rip the Lattice, causing discontinuous non-elastic behavior in the Lattice, coherence of the energy pulse with the dislocation would be broken.

The nature of light

Some characteristics of the motion of a photon through the Lattice can be compared to the motion of a sound pulse through a crystal, though there are significant limitations with this analogy. The dimensions of the Aa are discrete, as are the atoms in a solid. However, dislocations are also discrete, which is not the case for sound waves in solids. The photon kernel, i.e. its central dislocation, can not expand in size as it moves, nor is the size different for different energy photons. Each photon has the same "rest mass", which is based on the property of a single dislocation. The pulse field, however, can vary over a very wide range. This will be discussed later.

SLT suggests that the phenomenon physics has classified broadly as "**light**" is not a single phenomena, and can not be defined simply as an electromagnetic wave. The wave issue will be discussed at length later. SLT suggests that the phenomena classical physics classifies as "**light**" is actually three distinct phenomenon. All three produce mechanical "wave like" properties in the Lattice. What makes these phenomenon all appear similar is that they produce similar responses when measured by instruments designed to sense wave properties over the wavelength spectrum from infrared to ultra violet. The three phenomenon include: low energy photons; electromagnetic Lattice vibrations; and mechanical Lattice distortions.

The nature of light properties for photons

For photons, SLT suggests that the "color" of the photon, i.e. its wavelength, is not something that exists as a periodic wave in the Lattice. Instead, the "color" is the measurement technique's interpretation of the magnitude and shape of the photon propelling wave energy.

SLT also suggests that ultraviolet wavelengths mark an important transition point in photon energy which this paper calls the **ultraviolet threshold**. The property that **discriminates** a photon from other forms of "light" is its ability to transfer matter through the propagation of dislocations. Therefore, while photons can exist at energies

below the ultraviolet range, such photons no longer possess sufficient energy to transfer mass through nuclear processes in conventional matter or to electrons. While these weak photons are not able to make atomic changes, they may still possess enough energy for electron scattering. This is important because they must have this capability to be observed by most conventional detection methods. Eventually, some photons will lose sufficient energy so they are not able to cause electron scattering either.

As photon energy decreases further, the photons can still interact with matter in what might be considered pure mechanical-thermal interactions.

SLT suggests that photons can continue losing energy until their energy level approaches zero, at which point they will essentially come to rest in the Lattice. In that state, they will have pure rest mass, being naked dislocations, but will not be part of any macroscopic mass on the periodic table.

The photon phenomenon is further confused by the fact that mechanical and electromagnetic vibrations can exist into and above the ultraviolet range. They will produce wave-like and energy properties in sensors at those high energies. While they will be detectable like photons, they do not have the ability to transfer matter.

7.6 Photon speed

SLT suggests that photons can travel in the Lattice at speeds from "c" all the way to rest. The determinant of the speed is the magnitude of their driving pulse. The speed vs. magnitude function, however, is not simple.

Like waves in water and materials, SLT suggests that the speed of photons is not proportional to the size of their pulse waves once the pulse magnitude **exceeds a certain threshold energy.** In SLT, this energy level is called the C-THRESHOLD ENERGY. Above the c-threshold energy, the speed is determined by the LRR and equals "c". For **photon** pulse magnitudes below the c-threshold, the speed is approximately a linear function of pulse magnitude. Motion at rates lower than "c" will be discussed below in the section on object motion.

7.7 Refraction of light and photons

SLT suggests that the refraction of true light waves and photons must be considered as two distinct phenomena.

The Lattice fills space between the fundamental particles in an atom, between atoms, and throughout the universe. The Lattice has a structure to it, but is distorted by any matter that is present. The more dislocations that are collected in one place, the more the Lattice bends to conform to them.

For "light" phenomenon other than photons, the increased disorder of the Lattice requires the phenomenon's waves to follow circuitous but structured paths. A longer path to travel decreases the overall apparent propagation speed through a material. This observation is supported by observations that refractive index increases for gasses, liquids and solids as their density increases. {33} This model also explains how light, after slowing down in a dense medium, can resume a higher speed moving into lower density material, including returning to the speed c in a vacuum. That is, when returning to a vacuum, light is just traveling through less distorted Lattice again.

For photons, refraction must consider both the "energy" response as discussed above, but also the capture and scattering response of the photon due to its mass.

7.8 Red shift

Einstein's General Theory of Relativity (GR), with its description of the gravitational field, led some researchers to the conclusion that the gravity produced by matter in the cosmos would eventually cause our visible universe to collapse. **Einstein believed that the universe must be static.** In 1917, he published a paper that added a constant, referred to as the Cosmological Constant {12}, to the gravity equation in General Relativity. The constant added a repulsive force to universal gravity to counteract the gravity of universal mass. This mathematical "fix" was made without a functional explanation.

Around the time of this "fix" paper, a number of astronomers observed that spectral measurements of distant galaxies were shifted toward the red end of the spectrum in

proportion to their distance from earth as determined by non-spectral shift methods. In 1929, Edwin Hubble published a summary of these observations, based on the **assumption** that the shift was due to the Doppler effect. His results showed that distant stellar objects were moving away from earth at a rate that increased **linearly with distance** at 500 km/s/Mpc. {24} This value, when used along with its associated measurement model, is referred to as H0. This, supposedly, provided observational "evidence" that the visible universe was not static. Einstein, in an interview with George Gamow, stated that his introduction of the cosmological term was the biggest blunder of his life. {12}

While the Hubble constant, and the assumptions underlying Hubble's model, are still used to determine the distance of remote objects in space, the basic concepts surrounding universal expansion or contraction continue to be vigorously debated to this day. The most recent suggestions include concepts like Dark Matter, Dark Energy, and further fiddling with Einstein's equations. But there are significant problems with all of these approaches. Extensive research eventually revised H0 downwards to as low as 55 km/s / Mpc, a full order of magnitude below Hubble's claim. A humorous statement in a reference {24} about Hubble's Constant sums this up well: "By the late 1970's, this bimodality remained in the estimates of H0 and the middle ground was littered with the bruised and battered remains of young astronomers attempting to resolve the dispute between the two sides."

A major assumption behind the Hubble model is that photons are wave phenomenon. Once this is accepted, phenomenon that maintain wave count must be applied. There are only 3 accepted models that do this for red shift: Doppler, gravitation and space-time volumetric change. Since gravitational retardation of light is small for any objects other than black holes, and space-time warping would produce other major observational artifacts, Doppler was the only choice left.

A much simpler explanation for the **linear** spectral shift would be some form of energy loss with distance, i.e. a "drag" constant. This has been frequently suggested and is commonly referred to as the "lazy light" model. However, there are no accepted models for energy loss mechanisms that will result in a linear result with distance.

First, photon energy loss is only observed in the **laboratory** in relation to scattering phenomenon. These usually result in major energy shifts into known scatter patterns, resulting in the photon being completely diverted from its path. Over large distance scales, scattering processes would produce an exponential loss of photon count (intensity) plus spectral smearing, as is the case with radiation passing through an absorber. There would not be a linear spectral shift.

Second, if energy is lost, Planck's law predicts a wavelength shift based on e = hv (energy = planck's constant times frequency). But, photons, being considered waves moving at constant speed "c", there is no principle to explain how the energy loss converts to a red wavelength shift while simultaneously conserving wave count (i.e. to make any wave count spread out, does the front end move faster than "c", or does the trailing end move slower than "c"?)

SLT suggests a solution to this problem. The Lattice model suggests that photons are **not** waves. Instead, photons are "particles" that carry mass, plus an "energy" package that is interpreted by detectors as having a frequency component. The wave nature of photons is a referred quantity that only appears during the measurement process. This model opens up **numerous** options for photons to lose energy to the Lattice.

SLT suggests that photons in the "visual range" continuously lose energy traveling through the Lattice at rates in the range observed by Hubble and others due to simple mechanical losses from various factors encountered during passage.

This approach is significant in the following ways:

1. While a "Hubble" type red shift constant based directly on distance could still be valid as a rough distance measuring tool, it would no longer be linked to object velocity. So additional information would be needed to bound the spatial velocity of objects to account for Doppler shift for accurate distance estimation.

2. The whole view of the visible universe would again change as Hubble's claim of universal expansion, based on Doppler shift, would no longer be supported.

3. A new explanation is provided for Olbers' paradox. This paradox concluded that the great universe could not be infinite and filled with stars of approximately uniform density or the sky would be continuously bright rather than the darkness we see at night. SLT suggests that, due to photon energy loss during travel, the energy of light photons from very distant stars has become too weak, i.e. red shifted, to be seen.

   This would especially be the case if the universe was not uniformly homogeneous, but instead, spotted with visible universes at very widely spaced intervals. This would result in surrounding our visible universe with a large volume of starless space. Light coming from "localized universes" beyond that would be too faint and have too much red shift to observe.

4. Another alternative to Olbers' paradox, even for a homogeneous universe, is that we may be receiving light from all the distant stars, but due to red shifting, interpreting it as something other than light – i.e. **microwave background**. This suggestion comes from observing that, if photons do lose energy, it has to show up somewhere.

5. For an energy loss red shift model, a limit is placed on our ability to observe matter beyond the visible universe, even though it is there.

Additional considerations will be discussed later in relation to microwave background.

7.9 Theoretical SLT observation summary for photons

Theoretical SLT observation summary for photon construction

1. SLT **defines** a **photon** as being a combination of both a **single dislocation** in the Space Lattice and a **dynamic pulse field** which accompanies that dislocation.

2. Photons can be in **motion** or **stationary** in the Lattice.

3. The physical shape of a photon is the dynamic Lattice response to both the missing space of the dislocation and the pulse distortion field. This shape is not spherical except for stationary photons which only have a gravity field.

Theoretical SLT observation summary for photon creation

4. A photon is created when a single dislocation in a basic sub-atomic particle or electron shell, gets ejected into the Lattice.

5. The ejection is caused by the appearance, near a dislocation in a particle, of a high pressure region in the Lattice and a lower pressure region surrounding the dislocation.

6. Responding to the pressure difference, an Aa from the Lattice jumps to fill in the dislocation in a the particle.

Theoretical SLT observation summary for photon matter, mass and energy

7. Photons exhibit matter because they include a dislocation.

8. Since matter distorts the Lattice, it will produce the functional interaction called mass.

9. Photons in motion carry energy in the form of a photon pulse that propels the photon. This energy is mechanical stress-strain energy in the Lattice. The strain envelope defines the geometry of the pulse. The pulse's effect on the Lattice extends to infinity, but not in a $1/r^2$ form common of field structures. A pulse structure is much more confined.

10. The quantity of the energy in the photon at time of creation is determined by the sum of two phenomena: gravitational field energy and propelling pulse energy. The stress-strain of the Lattice deformation at the time the launching Aa transition occurs determines the photon's starting energy state.

11. If the energy of a photon's propelling pulse is dissipated, the photon comes to rest in the Lattice.

12. The energy of photons is not quantized! It can have any level up to an upper limit. Discrete levels are always observed in photons emitted by atoms due to the finite number of dislocation arrangements that Aa's can take as they form particles, which determine the energy needed to eject a dislocation.

13. The geometry of the photon pulse approximates a toroid centered radially on the dislocation it is driving.

14. The toroid extends ahead of the dislocation during forward motion due to the LRR.

15. The toroid size is many times the size of the dislocation.

Theoretical SLT observation summary for Photon particle–wave duality

16. The SLT photon model suggests a simple explanation for photon **particle–wave** duality: an energy pulse propelling a dislocation.

17. Measuring devices designed to observe particle nature will interpret the compact energy geometry of the photon as a particle.

18. Measuring devices designed to observe wave nature will interpret the energy content of the pulse as a wave in the process of detection due to the size of the pulse.

Theoretical SLT observation summary for matter–energy conversion, and the nature of light

19. Photons carry two forms of energy: gravitational; and propulsion.

20. Gravitational or inertial matter effects observed for a photon are associated with the dislocation carried in the photon.

21. The rest mass transferred by a photon is always the same independent of the photon energy. The size of the photon dislocation does not change during transmission.

22. The ratio of the gravitational distortion energy in the Lattice to the mass effect caused by the dislocation is quantified by the equation $E= m c^2$

23. Photon energy can exist over a very large range, from the highest cosmic ray energies all the way down to rest, where it essentially becomes a bare dislocation.

24. Once it's energy level drops below the ability to interact with matter through capture or scattering, it is no longer observable to known instruments.

25. The upper energy may be limited by Lattice disruption.

26. The energy pulse of a photon can be visualized as a rolling toroidal mechanical stress-strain wave field analogous to a smoke ring. This field does not exhibit a conventional $1/r^2$ magnitude loss with distance because it is not spherical in either the near or far field.

27. The size of the pulse, once created, can decrease as the photon moves.

28. If a moving photon encounters a particle with conditions that will allow capture, its discontinuity will add mass to the particle.

Theoretical SLT observation summary for the nature of light

29. Photon motion can be compared to the motion of sound in a crystal, however, with significant limitations. The major limitation of the analogy is that photons carry a discrete dislocation kernel which is composed of a moving void.

30. SLT suggests that the phenomenon physics has classified broadly as "light" are not a single phenomena, and can not be defined simply as an electromagnetic wave.

31. SLT suggests that the phenomena classical physics classifies as "light" is actually three distinct phenomenon that include: low energy photons; electromagnetic Lattice vibrations; and mechanical Lattice disruptions.

32. All three produce mechanical "wave like" properties in the Lattice that appear similar because they produce similar responses in instruments over the infrared to ultra violet spectrum.

33. The "color" of a photon is not due to a periodic wave in the Lattice. Instead, the "color" is the measurement technique's interpretation of the magnitude and shape of the photon propelling wave.

34. The property that discriminates photons from other forms of “light” is their ability to transfer matter through the propagation of dislocations.

35. SLT suggests that the ultraviolet energy level marks an important transition point in energy for photons because at lower energies, photons do not possess sufficient energy to transfer mass through nuclear processes in conventional matter.

36. Photon phenomenon are confused with mechanical and electromagnetic vibrations because their wavelength ranges so broadly overlap.

Theoretical SLT observation summary for photon speed

37. SLT suggests that photons can travel in the Lattice at speeds from rest to “c”.

38. The determinant of photon speed is the magnitude of its driving pulse.

39. The speed vs. magnitude function, however, is not simple with “c” forming a limit speed. The limit speed is reached at a threshold energy which is very low in the allowable photon energy range.

Theoretical SLT observation summary for refraction of light and photons

40. SLT suggests that the refraction of true wave light forms and photons must be considered as two distinct phenomena.

41. For “light” phenomenon other than photons, increased disorder in the Lattice requires the phenomenon’s waves to follow circuitous but structured paths. A longer path to travel decreases the overall apparent propagation speed through a material.

42. The path length model explains how light, after slowing down in a dense medium, can resume a higher speed moving into lower density material, including returning to the speed “c” in a vacuum.

43. For photons, refraction must consider both the “light” response as discussed above, because the energy pulse can be diverted by a bent Lattice, but also the capture and scattering response of the photon due to its mass.

Theoretical SLT observation summary for red shift

44. SLT suggests that photons with energies over the range measured for red shift studies are **not** a wave phenomena, but energy pulses.

45. SLT suggests that photon motion is not lossless. Photons lose energy at a continuous rate traveling through the Lattice. That rate is in the range observed by Hubble and others.

46. SLT suggests that cosmic red shift is the sum of photon energy loss and Doppler shift, but the Doppler component is small.

47. SLT provides an explanation for Olber's paradox. This explanation suggests that there may be great amounts of matter in the universe beyond our currently detectable range

8 Object motion in the Lattice

8.1 Wave analogy for object motion

The analogy of water surface waves that was used to discuss photons, is not applicable when trying to explain how matter can move through the Lattice at any speed. Waves in water do propagate at different speeds, but not over a very large range of speeds. Sound waves in gases or liquids, a better example for wave motion in a homogeneous 3-D space, are also not good examples because their speed variation is even more narrow and related to the thermal velocity of atoms. There are other wave related examples, however, that are applicable.

If a submarine is set in motion at a rate below that which produces turbulent flow, or cavitation, it will continue to move without power for quite a while. This occurs even though water exceeding the boat's displacement by thousands of times has to move out of the way and come back together behind it. The motion of the submarine is impeded by two types of force: pressure imbalances due to the wave field; and drag forces from the fluid flow over its surface. If this behavior is analyzed for a "frictionless fluid", i.e. no viscosity, the following result is expected for the pressure imbalance of the wave field:

> "In a fluid with no viscosity the pressure right at the tail would rise to the same value as that at the stagnation point on the nose; then the integral of all the pressures acting on the elemental areas (the pressure forces) would be zero." {36}

With no friction, the second component of drag due to skin friction is also absent. If the Lattice has no friction, i.e. no viscosity, then the analogy is that a dislocation moving in the Lattice acts like a submarine in water. In a frictionless fluid, the submarine will remain at rest unless some motivating force is applied. That force is needed to accomplish two tasks: 1. Overcome the inertia of the mass of the submarine; and 2. Establish a 3-D bulk wave phenomena in the water related to the boat's speed.

Relating this analogy to a particle in the Lattice: 1. dislocations, themselves, have no inherent mass. Their mass will be determined by the Lattice disturbance caused by the

particle's SSDV. The SSDV can be considered similar to the submarine. But, to be precise, the SSDV is still a **virtual** object. In SLT, any element of matter is actually nothing more than the **Aa disturbance field** caused by its SSDV. (This will be discussed at length later.) To move the SSDV, a force is needed to overcome the inertia of the SSDV; 2. a 3-D bulk wave in the Lattice is needed to accompany the SSDV while it moves.

SLT suggests that, using wave principles similar to those that create the submarine drift model, the motion of collections of dislocations which form stable particles, can move together in the Lattice at speeds lower than "c". The motion of the collection of dislocations is associated with a continual readjustment of the Lattice. This readjustment crates the property physics observes as stationary and moving inertia.

8.2 Speed limit for objects in motion

The speed of light limit

The Special Theory of Relativity (SR) suggests that nothing can travel faster than the speed of light from the viewpoint of each observer. SLT does **not** support this observation. SLT does set a motion speed limit, and the value of that limit is "c" for object motion, but it is always referenced to the Lattice. SLT also provides a functional explanation for this limit and will suggest some of the dimensional distortions which might accompany observations of high velocity object motion.

In the Lattice, when a dislocation is present, there is a response in the Lattice. Referring back to Figure 7-b, the Lattice pushes inward toward the dislocation in 3 dimensions. For a moving dislocation, the Lattice dynamically adjusts as the dislocation passes, pushing inward to fill the dislocation as it approaches and then being pushed outward as more highly pressured Aas push in to restore the disrupted Lattice in recovery. This is a very low loss process for objects moving at low speed, but not totally lossless due to LRR losses.

As objects speed up, SLT suggests that the LRR's ability to push Aas into the approaching dislocation will decrease (slow down). It will also increasingly resist the ability of the disrupted Lattice pressure to drive Aas back into the surrounding

prevailing Lattice positions to re-heal the Lattice as the dislocation moves away. Approaching the speed "c", an Aa **shockwave** would be expected to form because the LRR would strictly limit how fast the Aas could expand and compress in the Lattice. If the shockwave exhibited patterns observed for air, it would look like two thin conical shells at the leading (compression) and trailing (expansion) edges of the dislocation, oriented around the direction of motion symmetrical with the line of motion of the particle. The ability of the Lattice to respond will completely fail as the speed approaches "c".

As objects speed up, SR suggests that the mass of objects will be "observed" to increase towards infinity. SLT agrees with this prediction, but for a definite physical reason. To accelerate an object to a very high speed, a huge driving pulse field would be needed in the Lattice. The LRR would become a major impediment to building this pulse field. From an F=ma interpretation, an object's mass would be "observed" to be increasing, not because the "rest mass" was increasing, but because the force F would be measured as growing exponentially with respect to the measured acceleration growth to build the needed driving pulse.

Direct measures of mass for high speed objects could also be "observed" to increase for another reason. The SSDV shape would be deformed since the driving pulse would be compressing the shape against the Aa shockwave. Since **mass**, in SLT, is not a tangible substance, but rather the Lattice's gravitational response to the SSDV, the deformed SSDV could produce a stronger gravitational field signature in the Lattice. The actual " rest mass" of the object, however, would not change since its dislocation count would not change and its SSDV structural composition would stay intact, returning to its original form at reduced velocity. If this weren't the case, and SSDV could change at high speed, then high velocities would be observed to transmute elements.

SR suggests that length measurements will also be observed to decrease. SLT also agrees with this. As groups of SSDVs are pushed against the Aa shock wave, their length in the direction of travel will be compressed.

There is another ironic parallel between SR and SLT in regard to speeds near "c" in regard to "relativity". If there were mechanical instruments on two vehicles moving

side by side at speeds near "c", they would both experience similar deformations of their SSDVs. That is, as the lengths of their objects began to compress, it would apply to their measuring rods as well. So they would not experience any length distortions in their own vehicles or the other vehicle moving at the same speed with them. Stationary observers, i.e. those at zero Lattice speed, could confirm the dimensional shrinkage as well. That's where the parallel between SR and SRT ends.

In SR, the roles of the high speed vehicles and stationary observers could be interchanged. That is, the observers on the vehicles would determine that, in their frame of reference, they were not moving but the objects at the "stationary" site were moving. In SR, of course, there can be no "stationary" state. Because the vehicle observers perceive the "stationary" site objects as traveling at high speed, they would claim they had grown shorter (the twin paradox, to be discussed later). This would not occur in SLT. In SLT, the objects on the vehicles would, in fact, be experiencing an "absolute" compression. So the vehicle observers would determine that the stationary site objects had grown **longer**!

Another factor that would be different between SR and SLT is the result of using light beams to make measurements. In SLT, light always moves at the speed "c" relative to the Lattice. In SR, both the vehicle and stationary observers could use light to make measurements assuming its speed was "c" with respect to them. In SLT, not so. And this is a key observation behind the experiment suggested at the end of this paper to make real progress on the speed of light issue.

The important distinction between SLT, and Einstein's Special Theory of Relativity (SR), is that, all motion in SLT is referenced to the Space Lattice. For SLT, there is an objective limit, and objective explanations for why objects will appear heavier and shorter if they approach light speed.

Particle accelerator collisions

This raises the question about what happens to subatomic particles in accelerators that we know are each moving near the speed of light in the accelerator frame when they are smashed together in opposing directions.

From and SLT viewpoint, in order to accelerate such particles, strong, moving magnetic fields are used. The magnetic fields distort the Lattice which is what causes the particles to move. This creates a complex situation. In order for a particle to move, the Aa's in and around the particle have to move in and out of the dislocations that define the particle. As space is bent by the high magnetic fields, both the geometry of the particle and the geometry of the wave field in the Lattice moving the particle are distorted from their stationary form. Because the distortion will require greater energy to accelerate the particle, observers, using an F=ma model, will attribute the energy increase to the particle having a higher mass.

If two opposing particles are released from the magnetic fields just before collision to "free float", the Lattice surrounding particles must still exhibit a moving wave phenomena to continue moving the particles. The collision is therefore not just a collision of two fast moving "rest" masses, but the collision of two moving SSDVs and their motion sustaining wave fields as well.

For the purpose of discussing this collision, the example assumes a "superposition" of three events. It will become obvious that this is only a discussion tool to focus on a simplified history of three different simultaneous phenomenon, because the phenomenon cannot unfold simultaneously as a continuous linear superposition. The view is from particle A looking at particle B.

The first event would be the effect on each of A's dislocations caused by the dislocation's transporting pulse. This effect might appear as a stationary phenomena in A's moving frame of reference. However, unlike discussions related to SR, the dislocation and SSDV shapes will be very different from their rest configuration in the Lattice due to the distortion of the Lattice from the LRR and propelling wave. Unlike the simplified concept above of length compression for speeding vehicles, in SLT, at the Aa scale, even in the frame of reference of the moving Aas, shape distortions cannot be ignored.

The second event would be the passage through A of the pulse from B. That pulse would cause a dynamic event as it arrived at a speed of almost 2 "c". Since a dislocation is entirely a virtual object, the effect on the dislocation is actually a description of the Aa

rearrangement history for the collision of pulse B with pulse A. This pulse collision would be truly disruptive to the Lattice. Each pulse is already speed limited due to the LRR. That means, the Lattice is unable to faithfully transmit the stress-strain energy of the colliding pulse in a manner that will reform the pulse geometry after the collision. Instead, the Aas will undergo some rearrangement that represents their own collisions at 2 "c" and the Lattice will be non-linearly, non-continuously disrupted.

The third event is the direct collision of the dislocations. Again, dislocations are only virtual objects defined by their Lattice distortions. When the dislocations collide, they essentially merge, become a single void, and then disappear completely in the jumble of Aas produced by the pulse collision. The result is the possible formation of any particle in the entire range of particles allowable within the disruption zone of the Lattice as it reassembles. (This will be discussed in more detail later.)

8.3 Theoretical SLT observation summary for object motion in the Lattice

Theoretical SLT observations for object motion at low velocity:

1. SLT suggests that object motion at low velocity in the Lattice can be visualized using the analogy of a submarine, stationary or moving in water at a rate below that which produces turbulence.

2. As collections of dislocations move, they require a continual readjustment of the Lattice to address the moving stress-strain field associated with the dislocation.

3. SLT suggests that the Lattice Relaxation Response (LRR) creates a hard upper limit on the speed of objects in the Lattice.

4. SLT supports the speed of light "c" as an absolute speed limit for object motion in a **stationary** universal Lattice.

5. SLT supports dimensional distortions in the observation of objects moving at high speed similar to those presented in SR. These distortions, however, are not due to relativistic effects as proposed by the SR.

9 Force at a distance - Fields

9.1 The basis of ALL field structures in SLT

Force at a distance is one of the great puzzles in physics. The concept of a "**field**" in space is a foundation stone for gravity and all electromagnetic phenomenon. In physics, a FIELD implies a region in which a particular condition prevails, especially one in which a force or influence is effective regardless of the presence or absence of a material medium. The equations that form the science around fields provide very precise and repeatable measures of what the hypothetical fields do through interactions with matter or other fields. Yet no generally accepted **functional explanation** for the mechanism of gravity or electromagnetic fields has ever been presented. SLT suggests a comprehensive functional model for all known fields in the universe.

SLT suggests that **all forces** at a **distance** in the universe, between "objects", fields, or "objects" and fields, are due to **field patterns** of Aas in the Space Lattice. **All fields** in the universe are formed as **bending distortions** of the long-structure lines in the Lattice. Specifically, this implies that field structures are **not** formed from Lattice **disruptions**.

All forces at a **distance** are **caused** by the imbalance of **pressure** forces. There are **no tension** forces in the Lattice. A broad framework to understand this claim can be envisioned by drawing a parallel with a very common physical principle: a **vacuum**. A vacuum is not an actual physical entity. A vacuum is commonly perceived as an interaction of matter that produce a "suction" force on an object which "pulls" on the object. This is known to be incorrect. A vacuum is a mathematical and descriptive convention that is used as a simplifying principle. The forces on and motions of objects that are envisioned to be caused by vacuums are actually due to the imbalance of **positive pressures**. The positive pressures **are** due to **actual physical entities**. The total pressure induced force on an object is caused, not by a vacuum, but by an **imbalance of pressure** on the surfaces or interfaces of the object. Such surface acting pressures are **caused** by tangible, physical entities through observable, measurable processes. More specifically, conventional fluid pressures are a summation of momentum transfer from atoms in thermal motion impinging on the surfaces of solid objects or the interfaces between solids, semi-solids or fluids.

SLT suggests that a phenomenon similar to fluid pressure, which is currently unrecognized in science, occurs throughout the Lattice at the Aa scale. That is, the space Lattice is intrinsically under pressure. When dislocations are introduced into the Lattice, the shape of the Lattice changes due to the Aas adjacent to the dislocation adjusting their positions due to the pressure imbalance between the intrinsic Lattice pressure and the zero pressure of the introduced void. The shape adjustment and stress reduction extend out to infinity in decreasing amounts in proportion to distance. The shape adjustment propagates outward at the speed "c" as regulated by the LRR. The more matter that is introduced into the Lattice, the greater the overall **distortion** of the Lattice. The distortions that build up in the Lattice exert forces on individual dislocations through **direct positive pressure imbalances**.

Another requirement for the nature of fields is conservation of momentum. If a field acts on an object to impart an acceleration to the object in say a +X direction, the field itself must have some property that gives it a structure and foundation to resist being thrown without restraint in the –X direction. That is, any positive pressure applied by a field to a mass or another field in a +X direction, must itself be resisted by an inertia within the field, to prevent the field from being pushed back in the –X direction.

SLT suggests that this resistance is adequately explained by the implicit inertia of the Aas that compose the field. A field in the Lattice has a structure that extends to infinity. Therefore, the foundation of that field essentially is the infinite Aa mass of the universe. What defines the finite effective inertia of a specific field is the structure in the Lattice that it's source has generated. Due to the reduction of source influence in proportion to $1/r^2$, the contribution of inertia from distant Aas is small.

In summary, SLT suggests that **all** "forces at a distance" observed in physics are explained by this one positive pressure phenomena.

9.2 The effect of fields on dislocations

This discussion is worded to apply to a **gravitational** interaction. However, the same principles can be applied to all field types.

A dislocation is a "virtual" object. It has no tangible substance. When a dislocation exists at a location in the Lattice, what really exists is an Aa arrangement that is a distortion from prevailing Lattice that **defines** the dislocation's "void" volume. For the dislocation to be mobile in the Lattice, the void shape must enable some simple Aa motion that allows the void to move to a nearby point where the prior distorted Aa arrangement is duplicated. At the same time, the same simple Aa motion must enable the Aa distortion where the void previously occurred to be returned to undistorted prevailing Lattice. The rearrangement of Aas around a dislocation creates a "source" for the gravity field of the dislocation and can be referred to as the dislocation's gravity field. To be precise, the dislocation's "gravity field" is in fact, a focused stress-strain field in the Aa structure of the Lattice associated with the dislocation. This stress-strain field structure theoretically extends to infinity decreasing in magnitude in proportion to distance.

Now, consider a second field from some "external" source. All this means is that there is some other set of dislocations somewhere, possibly part of some massive object for example, that have established their own combined gravitational field – i.e. Aa stress-strain field. That field also, theoretically, extends from its source to infinity.

When dislocation "d" is said to experience a force from an external source "s", what actually happens is two infinite in extent gravitational **fields** "field-d" and "field-s" become interspersed: one associated with the dislocation, and one with the external source. To be more precise, the two fields do **not** remain distinct. Through a time based process, infinite fields "field-d" and "F-field-s" have **infiltrated** each other. For every Aa in the universe, which both of the fields can claim as part of their own field, for each instant of time, the stress-strain state of the Aas must come to a state that is the **true physical** sum, or superposition of both fields. This superposition state then represents a **deviation** from a pristine field for each field source. And, since all fields theoretically extend to infinity, both fields can claim every Aa in the universe as part of their own field.

As will be discussed later, most of the matter in the visible universe was created during a big bang event. This means that the gravitational fields for all that matter were created during that event and are **still** in the process of expanding throughout the universe. (As

will be discussed later, SLT suggests that this event was not instantaneous, but could have occurred over a long time span.) So all gravitational fields for all existing matter already exist. However, each field has only infiltrated with the fields from other matter that are within a distance "R" determined by the time span of their existence "T" where R=cT .

From the dislocation's spatial viewpoint, its field has become filled with Aas that are oriented and under stress conditions different from what its "near field" structure would produce in isolation from all other fields. The dislocation's near field would then experience a pressure imbalance to correct the discrepancy which is experienced as a force. The external field's source experiences the same force reaction, in proportion to the magnitude of the dislocation's field. And notice, the entire interaction is **anchored** by the inertia of every Aa in the universe!

As a general rule, the distortion in the Lattice will move a dislocation along a direction line pointing toward a local maximum distortion in the Lattice, typically known as the gradiant vector. The acceleration of the dislocation along the gradiant vector would be proportional to the gradiant magnitude.

9.3 Field strength vs. distance and field type

In conventional physics, the magnitude of a field induced force on an object is frequently observed to decrease in proportion to the square of the distance: $1/r^2$. Lower case "r" is typically used in field equations as the distance parameter quantifying the distance between the center of a field generating source and the object center due to the spherical geometry of most fields. Just as Einstein questioned the equivalence of inertial and gravitational mass, which SLT also does, the $1/r^2$ relationship should also be questioned on five accounts:

1. Do we truly understand how to measure "r"?
2. Are all values of r equally valid for the formula?
3. Is the gravity equation continuous over its valid ranges and over time?
4. Is the "2" exponent accurate and precise over valid ranges?
5. Do "r" and the "2" exponent apply equally for all field types?

SLT suggests that none of these five challenges have been adequately addressed by physics. While SLT suggests a new foundation to address them, much more detailed work will be needed to rigorously understand the answers. While the following discussions use **gravity** as a focus, the same field problems apply to electromagnetics as well.

Measuring "r"

Measuring "r" appears to be impossibly complex beyond all but simple approximations. Due to the LRR, gravity fields are all continuously dynamic. Any motion of a mass in the Lattice causes its field to become dynamic with a non-spherical, non-uniform, time varying field shape. The vector that defines "r" in both length and direction changes value continuously in time all along its length. For objects with only solar system separation distances, the gravitational field interactions are with fields that are already minutes old because of the "c" communication rate of the LRR. That means, the gravitational field magnitude and direction are significantly lagged from current positions.

If the sources are moving in the Lattice, then their fields are continuously distorted due to that motion. This changes the path over which "r" needs to be measured.

Another problem with measuring "r" is related to the measuring rod. There are events that might occur in the universe that substantially distort the Lattice, changing the compression of the Aas. Over long distances, this changes how "r" is measured.

The validity of "r"

This challenge asks whether "r" is valid over its entire range, from zero to infinity. SLT suggests "r" is **not** valid over its entire range and defines 4 zones, starting at r=0 and moving outward that have unique characteristics: 1. Dislocation near field; 2. Particle near field; 3. Far field; 4. Disrupted far field.

1. **Dislocation near field**

   As a gravity causing dislocation is approached, the Aas will eventually be seen to align in ways that break the long-structure order. The **virtual volume** that contains all the disruptions of the Lattice long-structure lines is referred to as the

DISLOCATION NEAR FIELD. The outer boundary of the near field, which may have irregular shape, is referred to as the NEAR FIELD TRANSITION. The Lattice structure in the near field is not continuous so gravity can **not** be defined there and does **not** exit there.

2. **Particle near field**

A particle in SLT is referred to as an SSDV. It is a stable collection of dislocations, which means it is a stable collection of near fields. The dislocations that form the SSDV itself possibly capture organized Lattice between them, but in ways that lead to what conventional Standard Model physics refers to as the strong force. So the volume of space defined by the outer boundary of the SSDV is a highly distorted zone that can not be represented by the standard gravity equation. This zone is referred to as the PARTICLE NEAR FIELD. The dislocation and particle near fields are collectively called the NEAR FIELD.

3. **Far field**

At distances outside the atomic nucleus, the Lattice long-structures are established at the time particles are created. The volume in space where a non-disrupted long-structure field for either a gravitational or electromagnetic source exists which can interact as a field with other fields is referred to as the FAR FIELD. Due to the LRR, upon creation, a source launches and ESD that propagates the field through the universe. This means, a source's far field is a dynamically growing volume in space. The far field will also continuously change whenever its SSDV moves.

4. **Disrupted far field**

As the distance from a source becomes large, the stress and strain levels from the source are subject to noise disruption from any event in the Lattice that can open the mechanical contact between Aas, thereby introducing an elastic stress-strain discontinuity. An example of an extreme situation might be the passage of a black hole through a sources gravity field. Less extreme situations might be caused by simple planetary or stellar passage. As will be discussed later, both

black holes and planets may have the ability to disrupt fields in the Lattice. If that is the case, then the continuity of **all** source fields in the universe will be disrupted by the entire path the disrupting objects traverse. The DISRUPTED FAR FIELD is the virtual volume of a source's field, which once had an accurate long-structure **distortion** pattern established by the passage of an ESD, but has become "effectively" disrupted by the passage of a large number of disruptors. The magnitude of a source's gravity in the disrupted far field is essentially zero. Furthermore, the structure of all prevailing fields in any source's disrupted far field is contaminated with that source's field disruption **noise**. This essentially states that the entire universe experiences field disruption noise.

In summary, SLT supports the $1/r^2$ relationship of field strength to distance, but only in the far field due to the reasons explained above.

Time continuity of fields

When matter is created, or an electromagnetic field is formed, it launches an ESD into prevailing Lattice that forms its defining field. The field "theoretically" extends out into the universe without limit. The size of the field, however, is time limited by the LRR. So, fields, while **capable** of expanding "indefinitely", all have a finite size based on the time since their creation. If the field source moves, an **incremental motion** ESD is launched to adjust the field. The adjusted field volume is then time limited based on its age. This creates a very complex time variant field environment in space because all of the mass of the universe is in motion, and all of the electromagnetic fields are dynamic in both magnitude and location.

In addition, SLT suggests that fields are **not stable properties** of their sources. Due to the ability of universal events to disrupt fields, a source's far field will decay over time through disruption. While a source field creates a motion ESD every time it moves or changes magnitude, the motion ESD will not be able to repair the disrupted long-structures because the incremental ESD adjustment is being made to a disrupted base structure. This will effectively create GRAVITY NOISE and ELECTROMAGNETIC FIELD NOISE throughout the universe.

The "2" exponent fall off of fields

If it can be confirmed that the factor of 2 exponents does apply to all field equations, this would be strong support for a 3-D universe and the geometry of spherical shells being the active ESD geometry for the Lattice. If there were more physical dimensions for the field's to expand into, higher exponents would be needed to describe the field strengths in the 3-D universe we observe.

Multi field type applicability

SLT also challenges that the same measurement of "r" and the "2" exponent, apply for different energy types (gravity, electrostatics, electromagnetics) just as Einstein challenged equivalence of "mass" for gravity and inertia.

9.4 Theoretical SLT observation summary for force at a distance

1. The term "**field**", as it is used in physics, refers to bending distortions of long-structure lines in the Space Lattice.

2. **All** forces at a distance which occur in the universe, between objects, fields, or objects and fields, are due to **field patterns** of Aas in the Space Lattice.

3. **All** forces at a distance are caused by the imbalance of **pressure** forces. There are **no attractive** (tensile) forces in the Lattice.

4. Fields, themselves, exhibit inertia, because the fields are simply arrangement patterns of the Aas, each of which has its own inertia.

5. **All** objects and field sources are "virtual" entities. They have no tangible substance. Rather, they are a stress-strain field in the Aa structure of the Lattice that is focused on and defines their associated virtual entity.

6. **All** fields theoretically are capable of extending to infinity. However, they do so as expanding volumes speed limited by the Lattice Relaxation Constant "c". Fields therefore all have finite sizes during finite time periods.

7. When multiple fields interact, they do so by **infiltrating** each other through a time based process.

8. All gravitational fields for all existing matter already exist. However each field has only infiltrated with the fields from other matter that are within a distance "R" determined by the time span of their existence "T" where R=cT .

9. For **every** Aa in the universe, which is a component part of many other fields in space, at each instant of time, the stress-strain state of the Aas must come to a state that is the **true physical** sum, or superposition, of **all** the field in space. This superposition state for each Aa then represents a **deviation** from pristine Lattice that is spatially proportional to **all** of the fields in the universe.

10. Each entity in space would produce a characteristic Aa distortion pattern in a pristine Lattice. If placed into a universe with a prevailing Lattice structure, the entity would then experience a pressure imbalance to correct the discrepancy between actual and ideal structures, which is experienced as a force.

11. A**ll** fields, theoretically, could include all of the Aas in the universe if allowed infinite time. But at a given finite time, due to the LRR, fields only include a limited part of the universe. That part, however, for typical interactions, includes a huge 3-D volume of space due to the high "c" expansion rate of the fields. Thus, all fields are **anchored** to substantial volumes of the universal prevailing Lattice. This, of course, is not true for very short durations after the creation of new matter.

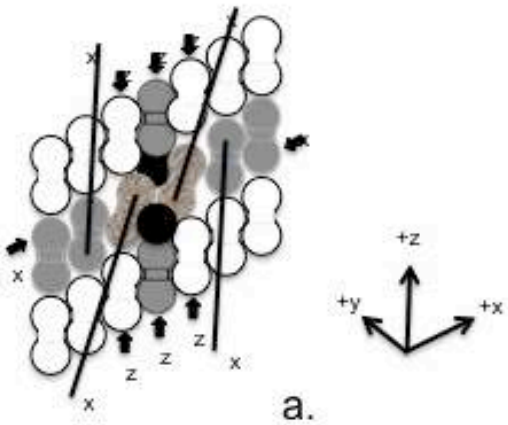
12. The magnitude of a stationary isolated field will decrease in the far field in proportion to the square of the distance due to the elastic relaxation of Aa stresses as the geometry of the field expands into a 3-D universe. There are many dynamic situations that will warp this relationship by disrupting the far field.

10 Gravity

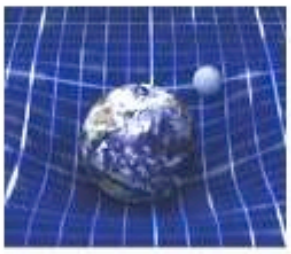
10.1 Gravity

Einstein stated that the property we call mass appeared in classical physics in two forms: gravity and inertia. His questioning of whether these two phenomenon referred to the same principle was the basis for his paper on General Relativity. He never actually concluded that they were due to the same, or different causes, instead carefully stating, “The **same quality** of a body **manifests** itself according to circumstances as "inertia" or as "weight" (lit. "heaviness”)”. {Einstein 1916} The terms “same” “quality” and “manifests” are emphasized in the quotation because they can each have connotations different from meaning “identical” or “equal”. While the properties physics calls gravitational mass and inertial mass are considered the same and are treated identically in classical physics and General Relativity, SLT suggests they have distinctly different origins in the Lattice. In prior section 6.2, inertial mass was described as an indirect property of the Lattice due to the kinetic motion of the Aas in the Lattice in the form of a complex wave function. The discussion in this section deals specifically with **gravitational mass** and describes it in a very different functional form.

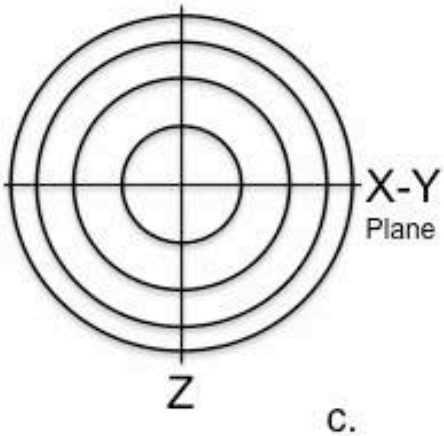
SLT suggests that the Lattice becomes distorted due to the introduction of dislocations during the creation of matter in the universe. More specifically, a dislocation due to the removal of an Aa causes the Lattice structure to push inward near the removal as shown in Figure 13 –a below. The Aas near the dislocation move toward the dislocation produced void due to the imbalance of pressure caused by the prevailing Lattice pressure. Due to the geometric structure of the Lattice and the elasticity of the Aas, the strain adjustment of the Lattice around the dislocation allows additional strain adjustments outward of the immediately affected Aas. This adjustment continues outward to infinity decreasing in magnitude in proportion to distance. The adjustment also occurs over time due to the limit of the LRR, so that the gravitational field volume is a dynamic continually expanding volume.



a.

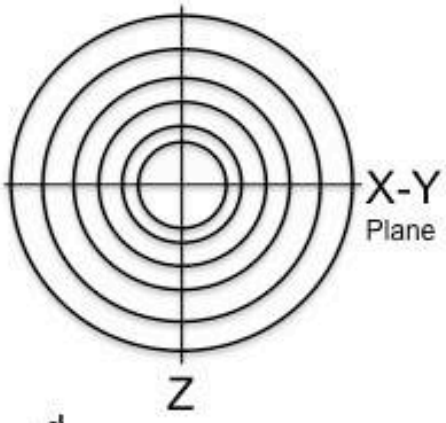


b.



c.

Gravity field contour plot



d.

Misleading gravity field contour plot of an elastic fabric with a dislocation

Fig. 13

Gravity field visualization

If many dislocations with Lattice adjustments of their own are brought together, the Lattice can significantly shrink around the collection of dislocations. The mechanical shrinkage pattern in the Lattice, which is a **mechanical stress-strain field** in the Lattice, produces the interactions physics calls a GRAVITY FIELD.

The SLT gravity field **generally** agrees with Einstein's **field** model, in the sense of being a **cumulative warping of space** by **matter** in proportion to the property we call **mass**. But, for SLT, this would be more accurately restated as follows:

A **gravity field** is the **cumulative warping** of a preexisting **space Lattice due to the introduction and presence of dislocation structures**. That is, SLT **specifically** suggests that gravity is **not** a continuous property of **space**. It is a property of a **Lattice** which fills space. Gravity does **not** exist between or within the Aas. The property we refer to as GRAVITATIONAL MASS is the strain **removed** from the Lattice by the introduction of an SSDV. The inherent strain in the Lattice is the result of the compression of Aas due to the inherent Lattice pressure in their pristine Lattice structure locations.

The energy of a gravity field is created in proportion to units of **mass**. "Mass" is **not** produced as a simple summation of dislocation count, but rather as a function of the Lattice distortion related to specific dislocation structures - SSDVs. Gravity is introduced into the Lattice in quantized units related to the finite number of ways hole dislocations can organize into stable structures that are not destroyed by the self organizing nature of the Aas. However, the gravity **field,** which is related to bending in the Lattice, is itself **not** quantized. It can have a magnitude of any value, both positive (**pushing** apart) or negative (**pushing** together) up to a **finite limit**, due to the summation of overlapping gravity fields and the non-quantized elasticity of the Aas. The finite limit is determined by the maximum amount the Lattice can bend before disrupting the Lattice structure. In that case, the Lattice structure becomes discontinuous.

SLT suggests that when two gravity fields (Lattice distortions) of the same type interact, the result on each is a force that **pushes** (not attracts) the fields toward each other. Specifically, SLT suggests that gravitational forces are **mutual field-field** interactions. That is, the typical "fabric of space" model associated with Einstein, that shows a

"mass", e.g. a planet, moving across a space fabric is **misleading** in relation to an actual visualization of SLT physics. Using the SLT model, this would more appropriately be depicted as a planet's "fabric distortion pattern" moving through a "space distortion pattern" in the same "fabric". For a space fabric to portray the gravity of a planet, it can show a bending in a fabric as shown in Figure 13-b. But for the fabric to show a gravitational "attraction" between two objects, it would also have to show a distortion in the fabric by some collection of mass other than the distortion caused by the planet.

The force one gravity field exerts on another would be the cumulative pressure that the Lattice exerts on the individual SSDV fields involved. The SLT gravitational force exerted on the SSDVs agrees **generally** with observed models, and is consistent with the Newtonian form: $Fg = - G m_1 m_2 / r^2$. For a mass m_1 located at the center of a coordinate system, and test mass m_2 located at some distance r along the +X axis, the negative sign in this equation produces a force on the test mass m_2 along the X axis in the –X direction.

There is an important observation to be made here. The directionality of this previous interaction applies to two gravitational fields from two masses assigned **positive** mass values: i.e. two positive fields ($+m_1$ times $+m_2$). On this basis, the same test mass response should occur if both the reference mass **and** the test mass have negative values: two negative fields ($-m_1$ times $- m_2$). Similarly, the example suggests that if the two masses have opposite signed values, independent of what value the reference mass has, the interaction of the fields will be such to push the test mass away from the reference mass. (This will be discussed further in relation to antimatter below.)

Again, SLT suggests that the motion of the test mass above is **not** an "attractive" force, but rather a **pressure** force due to imbalances in the Lattice.

The way a dislocation affects the Lattice was shown in Figure 7 and discussed above in the section titled "Response of the Lattice to matter". SLT suggests a direct explanation for how the gravity field works in Space. This explanation is easy to visualize. Figure 13-a is a copy of the graphic shown in Figure 7-b which shows how a dislocation distorts the Lattice. Figure 13-b shows how the term "fabric of space" is typically depicted. It shows a deformed 2-D piece of elastic fabric on which the lines do not

appear rectilinear due to their depression by an object. The non-deformed fabric supposedly had a rectilinear Cartesian set of grid lines printed on it. These 2-D depictions are common because of the common use of the term “fabric” in association with the gravitational field and the simplicity of drawing them. Figure 13-b depicts the earth and moon “warping” the gravitational fabric of the solar system, with the distance between the earth and moon compressed about 30 times in relation to their diameter.

The elastic fabric model is partially accurate in that, around a mass, the contour lines of equal stress spread out if the fabric is depressed. This is shown in Figure 13-c. But the analogy breaks down in relation to an elastic fabric if a **dislocation** is introduce into the fabric, because an elastic cloth would be in tension. If a dislocation, i.e. the removal of part of the fabric, was introduced, the fabric would pull back and the contour lines would become closer together near the dislocation with a large hole at the center as shown in Figure 13-d. The 2-D grid representation of course can not easily be extended as a 3-D visualization.

Figure 13-c provides an easy way to visualize the SLT gravity field in 3-D. The graphic shows a 2-D contour map of a gravity field as a section view looking into the page. The contours represent Lattice Aa alignment spacing lines. When a dislocation is brought into the Lattice, the spacing of the Lattice elements increase around the dislocation due to the reduction of counter pressure where the Aa dislocation occurs. Now, envision spinning the contour graphic like a child’s toy top or dreidel around the Z axis. It would create a nest of spherical shells, which is the form that a 3-D contour map of a gravitational field would take in SLT.

10.2 Gravity vs. distance

Overview

A commonly used equation for gravity is the one presented by Newton: $Fg = - G m_1 m_2 / r^2$. A common mistake in the application of this equation is to consider the equation valid as r is allowed to vary without limits. SLT does **not** support this. SLT suggests specific problems for this equation in four cases: 1. misunderstanding of Newtonian physics; 2. near field; 3. disrupted far field; and 4. overlapping fields.

Misunderstanding of Newtonian physics

According to Newton's shell theorem, the gravity field vector "**g**" at any **point** in space **external** to a **spherical shell** can be found by using the equation: $g = - G m/r^2$ to determine the magnitude of the field. A line between the point in space and the spherical center of the shell will determine the vector orientation. The mass "m" is the mass of the shell, the distance "r" is the distance from the point in space to the spherical shell center, and the force will point toward the spherical center. However, the key point of this "shell theorem" is that the magnitude of the gravity field **internal** to the shell is **zero** at **every** point **internal** to the shell including the point where $r = 0$. Emphasizing this again, the gravity field is **zero** at $r = 0$. Many applications of the gravity equation fail to understand this and claim the magnitude at r=0 is infinity.

A solid spherical body can be modeled as a number of concentric spherical shells. If measurements were made moving from the outside shell toward the center, Newton's shell theorem predicts that the gravity field strength would be measured at decreased levels each time the measurement moved inside another shell since the gravity effect of all the shells external to the measurement become zero. For a single shell of uniform density, the gravity level would be highest at the outer edge and decrease to zero at the inner edge. For a sphere of uniform density, the gradient of the gravity field falls linearly with "r" internal to the sphere, equaling **zero** at r=0. This is due to the simple condition that the mass of the sphere decreases as r^3 while the gravity potential at the same distance is increasing as $1/r^2$. Replacing "m" in the previous equation with ρr^3 where ρ is the density, we get $Fg = - G \rho r^3 / r^2 = - G \rho r$, which becomes zero at r = zero. If a small void were placed at the center of the sphere, a mass placed in the void would experience **zero** force.

A similar model would apply even if the shells each had different densities. The difference would be that the rate of decrease of the gravity field would not be linear, but would follow the variation of density. The gravitational magnitude at the center would still be **zero**.

This same "zero force" misunderstanding results as a **paradox** if the $1/r^2$ relation ignores Newton's shell theorem. If a tunnel is drilled through the center of a sphere, and the **direction** of force is measure on a test mass moving through the tunnel, the

direction has to change from plus to minus along any axis that passes through r=0. To make that switch, a mechanism must be described that allows a $1/r^2$ force to jump from plus infinity to minus infinity over zero distance without passing through zero – thus the paradox.

Newton's shell theorem results in an important observation for spherical mass distributions which is very important for the SLT model: the gravity field produced by a spherical mass, **external** to the spherical boundary of that mass, is **only dependent** on the **mass internal** to the boundary, even if there is additional mass in the same symmetry external to the boundary.

The implication for SLT is that **dislocations,** being **voids,** do not **inherently** contribute to gravity because they do not include a Lattice **bending** distortion and do not exhibit the property of mass. The property of mass is caused by the bending of the Lattice that occurs in the presence of a dislocation but is outside the near field void of the dislocation itself.

While a **single dislocation** mechanism which does distort the Lattice to produce mass was discussed in the section titled "Response of the Lattice to matter", other distortion structures involving **multiple dislocations** will occur in the formation of **particles**. The mass "effect" is dependent only on the resulting Lattice distortion, not simply on the dislocation count times a fixed "dislocation value". This has significant implications for the principle of conservation of mass in particle interactions, especially involving photons.

Gravity in the near field

Gravity is caused by Lattice **bending** due to the rearrangement of Aas around dislocations. "Bending" here implies that the Lattice is distorted from its pristine Lattice state while the geometric **structure** of the pristine Lattice is still preserved. In the case of gravity, the "bending" can best be pictured as a graduated spherical expansion.

As a gravity causing dislocation is approached, the Aas will eventually be seen to align in ways that break the far field order. The virtual volume that contains all the disruptions of the Lattice long-structure lines is referred to as the NEAR FIELD. The

outer boundary of the near field, which may have irregular shape, is referred to as the NEAR FIELD TRANSITION.

In the near field, the following observations can be made.

1. The concept of gravity is no longer relevant in the near field. The gross misalignment of the Aas would not interact with far field structures in the way two far field structures would affect each other.

2. The misalignments are **quantized** in the number of stable arrangements they can take.

3. The phenomena of gravity is **not** a **continuous** property of space at the sub-Aa level. It does not exist between the Aas. It does not even exist at the scale of individual Aas. The phenomena can only be said to occur at scales sufficiently larger than the near field transition where the interacting Lattice fields both have continuous Lattice structures, and where the summation of the distortion strains of two or more fields still do not force the Lattice structure to become discontinuous.

In the vicinity of dislocations, the rearrangement of Aas can have large Lattice misalignments relative to the related bending distortions observed at large distances. However, the condition, 'for gravity to function as physics observes, the fields must not involve a disruption of the Lattice', implies that the magnitude the gravity field can achieve is limited. That is, the maximum bending between two Aas in a gravitational field can not exceed the Lattice's ability to maintain continuity. If continuity is broken, a phenomenon other than gravity must be associated with the result.

This hard limit on gravity implies that **gravitational singularities are not possible.**

Gravity discontinuities in the disrupted far field

As the distance from a specific mass becomes large, the stress and strain levels from that mass, which constitute its gravitational field, are more frequently subject to disruption from events in the Lattice that can open the mechanical contact between Aas, thereby introducing an elastic stress-strain discontinuity. The passage of black holes, for example, was discussed previously for fields in general. In the case of gravity, as will be

discussed later, "large" collections of mass, where **large** may be only on the order of earth's moon, may entrap the gravity field sufficiently to create disruptions in the far field continuity of many fields, especially when the disrupting masses have high rotational speeds. (This will be discussed later in relation to the Michelson-Morley controversy.) However, the effect such a break has on the **source mass** is limited by the contribution of the field strength at the point of break and the LRR time from the break back to the mass. For cosmic scale gravity, far field disruptions can take a very long time to impact their source mass.

Gravity with overlapping fields

If the assumption is true that gravity fields theoretically extend to infinity, with decreasing but non-zero magnitude, then every point in space must be considered having a gravity field which is the "sum" of the gravity fields of **all** the masses in the universe relative to their distance. For locations in space far from mass concentrations, this does not present any problems. But, for locations near very high mass concentrations, the maximum bending limit of the Lattice must be addressed as the gravity fields interact.

For example, consider the collision of two massive black holes. Assume that they are so dense that they push close to the limit of Lattice bending near their edge. As these two objects approach, their gravity field bending "adds". First thoughts would be that the most critical place for concern would be a point halfway between the two. This is not so however, because the direction of bending between two similar gravity type objects is opposite. There will always be a libration point (Lagrangian point) between them where the force on a mass is zero. The field "addition" can be seen to have opposite bending which cancels to zero. That is, for any combination of similar type masses (gravity, antigravity) for which none are Lattice disrupting, the superposition of their fields **between** them can only reduce Lattice bending, not increase it.

On the other hand, the field directions will add constructively at the faces of both objects which face away from the other object. If any object can develop a gravitational field that comes close to disrupting the Lattice, then the approach of even small objects can push their far faces into Lattice disruption.

Another disruption case would occur if gravity waves produced by major universal events interacted with the strong fields around massive objects.

10.3 Gravity waves

Since gravity is a bending of the Lattice structure, SLT suggests that the motion of a mass will produce a moving gravitational field which will appear as waves in the Lattice. Since the Lattice will respond to the waves as it does to all other distortions, the gravity changes will move through the Lattice at the speed "c". If the motion of the moving mass is such that it would generate a wave phenomenon, then there would be gravity waves that could theoretically be measurable. So far, science has failed to find them. SLT suggests two simple reasons for this failure. 1. Most waves from objects outside our solar system are too weak for current instruments. SLT does suggest an exception to finding strong waves which will be discussed later in the section about the Big Bang. 2. Science is using an overly narrow definition of gravitational waves.

Weak gravity waves

With a $1/r^2$ decrease in gravity field magnitude, gravity waves produced outside our solar system would be very small when they reach earth. In addition, many cosmic events have geometries that do not produce large waves. Exploding stars, for example, don't produce measurable **far field** gravity waves because their effective mass remains spherically centered.

Orbiting binary stars, having two masses, would produce spreading waves in all directions. These would appear to arrive like waves on a beach if viewed in the plane of the stars' orbit, decreasing to zero along the axis of rotation. But even a binary pair does not act like a single mass vibrating in space. This geometry is shown in Figure 14 below.

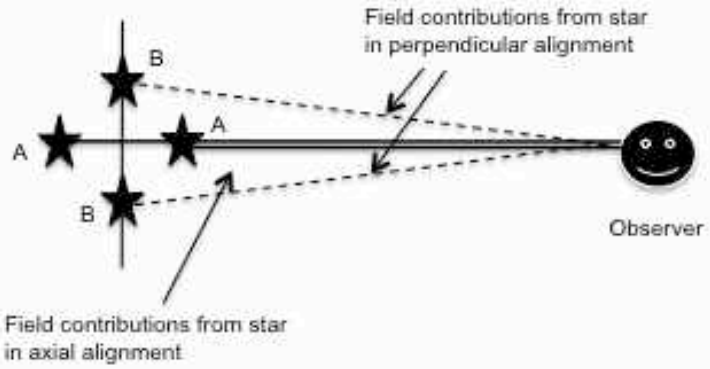


Fig. 14

Gravity Waves from binary star system

The magnitude would be proportional to the difference of the remote combined field of the stars when they align with the visual axis (A-A in the figure) vs. when their alignment is perpendicular to the visual access (B-B in the figure). The fact that both stars contribute to the gravity field weakens the differential motion effect by an additional factor of d / r where d is the stars orbit diameter resulting in an approximate gravity field fluctuation at the observer of: $F = - G m d / r^3$ where m is the combined mass of the system. As a ratio to earth's gravity we get: delta $F = G m_{stars} d / G m_{earth} r^3 = d / r^3$. Using parameters for a typical binary system like the Hulse – Taylor pulsar (PSR 1913+16) {Ju 2000}, $d = 10^6$ Km; r = 5Kpc, we get delta $F_{g\ stars} = 7.6$ E-37 $F_{g\ earth}$. Current gravity wave sensor sensitivities are well below this {20} even before we address the signal to noise problem.

Narrow definition of gravitational waves

Extra terrestrial gravity changes can be detected for close cosmic objects like the moon, sun and other planets. These can be inferred through visual and time measurements from telescope observations. They can also be directly measured with gravimeters. These experiments are usually not considered "wave detection" because the wave frequencies are so low. SLT does consider them waves.

10.4 Gravity and Inertia

As discussed in the preliminary section titled "Inertia and inertial mass" the **inertia** of **mass** is an inferred property in SLT caused indirectly by the true inertial properties of Aas in the Lattice. However, the inertial "wave-field" of a mass is the **same** as its gravity **field** in that the **distorted Aa structure** related to a mass is involved, capturing the same Aa structural distortion, in determining the inertia of that mass.

Nevertheless, the two phenomenon are distinct. The "gravitational" function of "mass" (i.e. gravitational mass), which is a gravitational force between two similar entity types, i.e. masses, is distinct from the "inertial" function of "mass" (i.e. inertial mass), which is a **counter-force** between a mass and a **force-field**. In other words, for gravity, two gravitational fields interact in such a way that they push their source masses **toward** each other with a force proportional to the sum of the masses and inversely with distance squared. For inertia, the source mass's gravitational field interacts with a

mechanical force-field in such a way that the force-field and the gravitational field push themselves **away from** each other with a force proportional to the force-field strength and some distance function also inversely proportional to distance. The inverse function is dependent on the electro-mechanical properties of the objects involved.

Both functions, however, are related to the same Aa structure that defines an object's **mass** – its SSDV.

A mass at rest has a static gravity field which extends to infinity. This field is defined by the shape of its Aa distribution. When matter is in motion, the motion distorts the static gravity field as the Lattice continually adjusts to the new location of the mass. For the mass to continue to move, it must be accompanied by an energy field of some type that will support the continuous restructuring of the Lattice as the gravity field moves through it. If a mass is moving at constant speed through the Lattice, its gravity field is no longer perfectly spherical, but has a swept back "conical" appearance due to the LRR. To maintain the conical shape as the mass moves through Lattice, the Aas in the mass's field must adopt a wave-like motion which create greater bending in the Lattice ahead of the mass as it approaches and reduce the bending in the Lattice behind the mass as it passes. Once a kinetic energy pattern is established in the Aas of the mass's gravity field to achieve this "steady state motion", in a "lossless" environment, that energy will act to sustain the motion. It would take external energy to initially create the pattern. An equivalent amount of energy would have to be removed to return the pattern to a rest state.

This explanation brings us to the questions of the effect of mass size and speed range on inertia.

SLT suggests that the gravitational field extends to infinity in all directions, which is consistent with conventional physics, subject to SLT far field abnormalities. This implies that **every** Aa in the universe is part of the gravity field of **every** particle of matter. That is, for a given object, without regard to its mass, every Aa in the universe is involved in determining the gravity of that object. This would become a simple issue if the gravity field at any point in space was related to a linear sum of the gravity fields from the SSDVs that define the mass of the universe , which appears to be the case. That would

require that the bending of the Lattice not be quantized, which is what SLT suggests. And, as long as the motion of Aas required to create static and moving inertia are also subject to superposition, there appears to be no limit on the range of inertia as long as the Lattice is not disrupted.

Speed is a very different problem because of the LRR. As the speed of objects through an absolute Lattice approach the LRR, the wave motions of the Aas are constrained by the cone shape of the Lattice response. Due to the LRR, the cone edge is a hard limit for the gravity field and would produce severe Lattice structure discontinuities. If the gravity field is limited, then the inertial response would become discontinuous as well.

In summary, the Aas that create the gravity field of a mass, are responsible for its inertia, because the motion of a mass through the Lattice is a continual restructuring of the gravity field. It takes energy to establish the continual restructuring motion. So the "rest state" of the Aas acts to keep the mass stationary. Once the mass is moving, it takes energy to reduce the restructuring motion, which is the impetus to keep the mass moving.

10.5 Gravity and Antimatter

Like other terms in physics, the term "antimatter" was a poor selection to describe the phenomenon it is currently associated with. This can be explained using a short historical summary:

> "In 1930, Paul Dirac formulated a quantum theory for the motion of electrons in electric and magnetic fields… This theory led to a surprising prediction: the equations that described the electron also described, and in fact required, the existence of another type of particle with exactly the same mass as the electron but with positive instead of negative electric charge. This particle, which is called the positron, is the **antiparticle** of the electron, and it was the first example of **antimatter**." {Barnett 2002}

The problem caused by the use of the terms "anti-**particle**" and "anti-**matter**" for Dirac's observation is that the only parameters negated by the positron, from the

electron, are electrical **charge** and **magnetic moment**. **Mass**, the primary parameter of matter, is not negated, nor is the particle nature of the positron.

> "Dirac's prediction applies not only to the electron but to all the fundamental constituents of matter (particles). Each type of particle must have a corresponding antiparticle type. The **mass** of any antiparticle is **identical** to that of the particle. All the rest of its properties are also closely related but with the signs of all **charges** reversed. For example, a proton has a positive electric charge, but an antiproton has a negative electric charge. The existence of antimatter partners for all matter particles is now a well-verified phenomenon, with both partners for hundreds of such pairings observed." {Barnett 2002}

Other citations state variations in other parameters including: magnetic moment, lepton number and baryon number. None mention the negation of mass. In disagreement with Barnett, the antimatter particle for a neutron, the antineutron, of course can not have charge reversal. Instead, it is claimed to be composed of "antiquarks" which have their fractional charges reverse.

Mass negation has previously been suggested.

> "The term antimatter was first used by Arthur Schuster in two rather whimsical letters to Nature in 1898, in which he coined the term. He hypothesized anti-atoms, as well as whole antimatter solar systems, and discussed the possibility of matter and antimatter annihilating each other. Schuster's ideas were not a serious theoretical proposal, merely speculation, and like the previous ideas, differed from the modern concept of antimatter in that it possessed **negative gravity**." {1}

SLT suggests both a model for an anti-mass structure and functional explanations for how it would occur and interact with other material.

If matter is caused by a hole dislocation in the Lattice, which is the **absence** of an Aa, SLT suggests that ANTIMATTER properties would be caused by the occurrence of an extra Aa stuffed into the Lattice structure: an insertion dislocation. The primary effect of such a distortion would be **antigravity** since the Lattice would be expanded around the intruding Aa, rather than contracted as is the case for a hole dislocation.

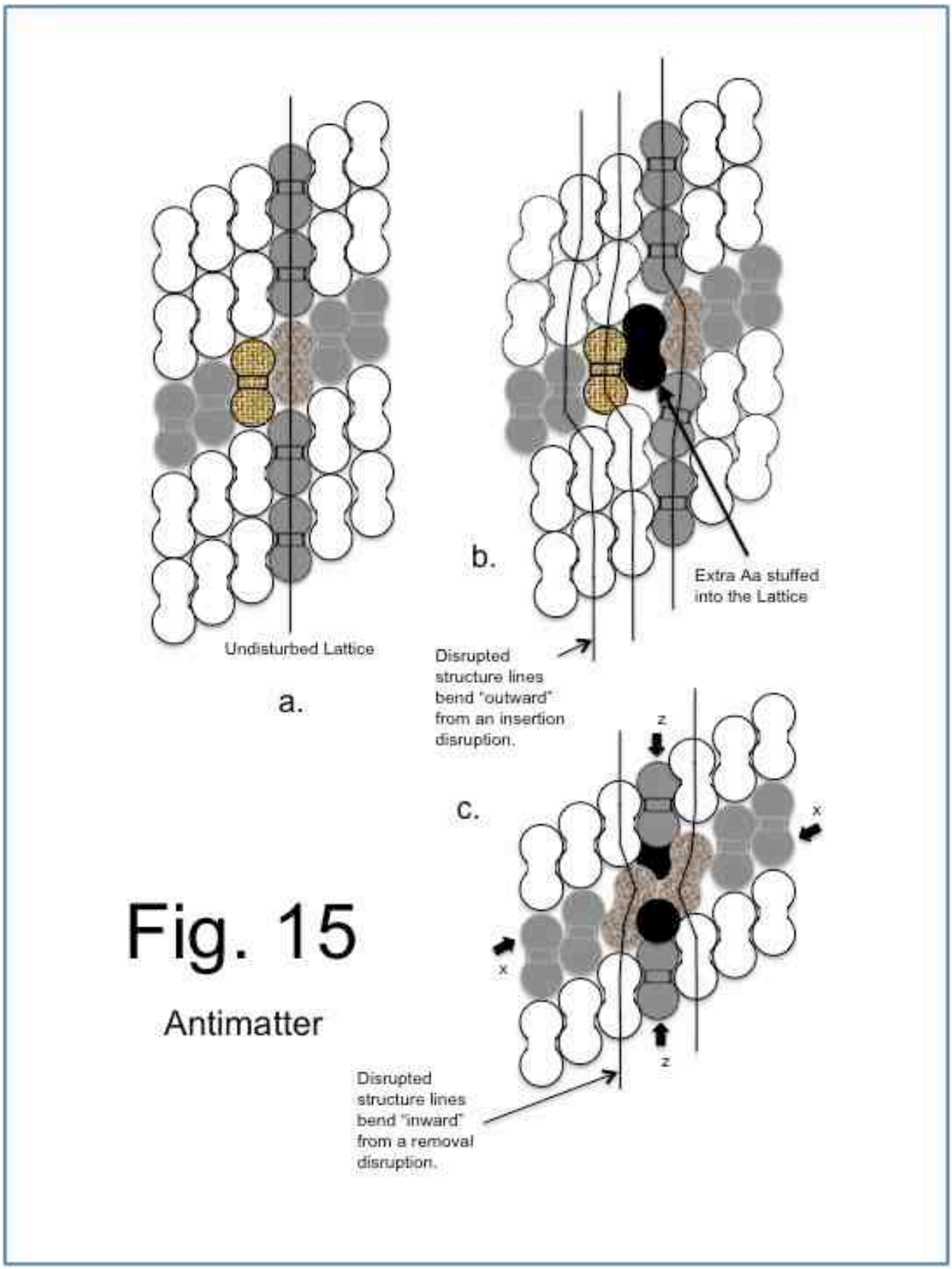


Fig. 15

Antimatter

Figure 15-a above shows a 2-D portion of a Lattice with no dislocations. The Aas are shown with different shadings for ease of observing changes. A single "structure line", passing vertical through the speckled Aa, is shown to depict how the Aas would align in undisturbed Lattice. Figure 15-b depicts a Lattice with one additional Aa (shown in black) **forced** into the Lattice. Notice the speckled Aa is pushed to the right, while the weave textured Aa that was to the left of it, is pushed left. "Structure lines" are drawn to follow the original Aa structure showing how the lines bulge **outward** away from the disrupting inclusion dislocation shown in black. This outward Lattice distortion would create an "anti" gravity field. Figure 15-c shows the deformed Lattice from Figure 7-b for comparison. Figure 15-c shows the Lattice response to a void or hole dislocation, which causes conventional matter. Structure lines have been added to this as well. Notice how they bend **inward** toward the dislocation.

It is important at this point to expand on the previous discussion of directionality of gravitational interactions. Newton's equation is: $Fg = - G m_1 m_2 / r^2$ which describes the force on a test mass m_2 with respect to a reference mass m_1 . Both masses are assumed to be conventional (Dirac) masses for this equation. The equation can be modified to represent the gravitational **field** of the reference mass in the form: $Fg = - G m / r^2$. This leads to two direct observations.

1. If the sign of both of the masses in the **force** equation are reversed ($-m_1 -m_2$), the force direction on the test mass remains the same. Also, if the sign of **either** mass is changed, but not both, the force direction will be changed. In short: like masses attract; "opposite" mass types push apart.

2. With the "m" in the field equation having a positive value, we have a field that shall be termed a NORMAL GRAVITY field. A normal gravity field, which must have a source composed of Dirac (normal) matter, will cause a Dirac test mass to move toward it. If the "m" in the field equation is made negative, then the field reverses producing an ANTIGRAVITY field. An antigravity field, which must have a source composed of antimatter, will cause a Dirac test mass to move away from it. While this clearly establishes a field shape in SLT, based on observation 1, this doesn't tell us the interaction this field will produce with a test object unless we know the sign of the mass it is reacting with.

This creates some interesting possibilities:

1. both conventional matter, **and** antimatter will push towards matter of their own type. This suggests that assemblies of similar type matter, both Dirac and antimatter are promoted by gravity.

2. Different types of matter will push each other apart. This suggests that matter-antimatter collisions are resisted by gravity, minimizing such collisions. If a large collection of either type of matter occurs, say on black hole scales, it will repel all approaches of the other type of matter.

10.6 Theoretical SLT observation summary for gravity

Theoretical SLT observation summary for gravity

1. Gravity is introduced into the Lattice during the creation of matter and is due to **dislocations** in the Lattice structure.

2. Dislocations in the Lattice structure cause Aas surrounding the dislocation to push inward, thereby bending the Lattice structure. The bending of the Lattice creates the phenomenon we call the gravity field. There is **no** gravity between the Aas.

3. The gravity field from a mass extends out to infinity decreasing with the square of the distance, which is consistent with conventional physics. The decrease is due to the elasticity of the Aas and the spread of stress energy into a 3 dimensional space.

4. Gravity is **introduced** into the Lattice in quantized units related to the finite number of ways hole dislocations can organize into stable structures. However, the magnitude of the gravity field itself, at any point, is **not** quantized. The quantization introduced by mass in the near field decrease with distance in proportion to the field strength.

5. Gravity is created in proportion to units of **mass**. "Mass" is **not** produced as a simple summation of dislocation count, but rather as a function of the Lattice distortion related to a specific dislocation structure - SSDV.

6. The maximum gravitational force that can be exerted by the Lattice is **finite**. The force is limited because the position and shape distortion of individual elements of the Lattice is limited. The bending limit is dictated in a quantized way by the limits that an Aa can be distorted in its role as one Lattice structural element before it jumps to another role.

7. Gravity singularities are not possible because of the limitation on disrupting the Lattice.

8. The interaction of two similar gravity fields results in the fields being pushed together by an imbalance of Aa pressure.

9. The popular "fabric of space" model is misleading in that it portrays an elastic fabric being distorted by a solid mass. SLT suggests that a more appropriate model is two distortions in a fabric interacting.

10. SLT suggests mechanisms that produce both normal gravity and antigravity. This model suggests that gravity fields of like polarity are pushed together by the Lattice pressure (both normal and antigravity fields), while fields of opposite polarity are pushed apart.

Theoretical SLT observation summary for gravity vs. distance

11. Gravitational field strength reduction with distance is similar to the field geometry for other energy types because they are **all** actually variations of Lattice distortion in a 3-D universe. The general reduction rate is described by Newton's equation: $Fg = -G\ m/r^2$

12. SLT does not support the application of the gravity equation as r is allowed to vary without limits, specifically as r approaches zero as described by Newton's shell theorem. The shell theorem explains that the highest magnitude of gravity will exist at the outer boundary of any gravity forming matter. The gravity at r=0 is zero, not infinity.

13. Gravity can only occur as long as the Lattice is not discontinuous. In the "near field", around a dislocation, the Lattice is discontinuous. So "r", in the gravity equation can never reach zero.

Gravity discontinuities in the far field

14. While the gravity field of every particle, theoretically, reaches to infinity, and gravity requires continuous Lattice, the gravity field can be interrupted by any event in the universe capable of breaking the continuity of Lattice structure lines. However, the effect such a break has on the source mass is limited by the contribution of the field strength at the point of break and the LRR time from the break back to the mass.

Gravity with overlapping fields

15. With overlapping gravity fields, the maximum bending limit of the Lattice must be addressed. Ironically, this does **not** create a problem for the fields between objects because the field directions are opposite and reduce the field. The area of concern is at the **face** of each object which faces **away** from the other object. At that point, the fields have the same bending direction.

Gravity – waves

16. Since gravity is a bending of the Lattice structure, SLT suggests that the motion of a mass will produce a moving gravitational field which will appear as waves in the Lattice which will move through the Lattice at the speed "c".

Gravity and Inertia

17. The **inertia** of **mass** is an inferred property based on the inertial properties of the Aas in the Lattice.

18. The inertial "field" of a mass is directly related to its gravity field. But the "gravitational" function of "mass" (i.e. gravitational mass), which is the gravitational field, is distinct from the "inertial" function of "mass" (i.e. inertial mass) which is a wave function that propels that mass.

19. SLT suggests that gravity and inertia, are actually only slightly different Aa patterns of the same Lattice structure for a specific mass. The inertial component for moving

objects is created by wave motions of Aas that move dislocations through the Lattice. The inertial component for objects at rest is the energy needed to establish the wave component for motion.

20. There are no limits to the magnitude of inertia as long as the object's inertial field does not cause discontinuities in the Lattice.

21. Both gravity and inertia are severely impacted as object speeds approach the LRR rate "c".

Gravity and Antimatter

22. Since hole dislocations in the Lattice are the **absence** of an Aa, SLT suggests that **antimatter** is the **occurrence** of an **extra** Aa stuffed into the Lattice structure: an insertion dislocation. Such a distortion would create **anti gravity** since the Lattice would be expanded around the intruding Aa.

23. SLT uses the term "antimatter" to describe objects that produce "antigravity", not opposite electrical charge.

24. SLT suggests both a model for an anti-mass structure and functional explanations for how it would occur and interact with other material.

25. Antimatter would **attract** other antimatter, just as matter attracts other matter. Antimatter and matter would repel each other. This property would favor the agglomeration of both matter and antimatter objects. It would also repel material types that could destroy it through matter-antimatter collisions.

11 Special issues in cosmology

This section is placed here in the paper rather than near the end because many of the special issues discussed introduce new principles in a simplified way which are helpful later to discuss more complex concepts in electromagnetics and particle physics.

11.1 The Big Bang

> "The BIG BANG Model is a broadly accepted theory for the origin and evolution of our visible universe. It postulates that 12 to 14 billion years ago, the portion of the visible universe we can see today was only a few millimeters across. It has since expanded from this hot dense state into the vast and much cooler cosmos we currently inhabit." {6}

The model arose as an attempt to explain the currently **estimated** motion distribution of cosmic objects in relation to the currently **estimated** mass of those objects and the observed properties of gravity and the cosmic microwave background. All of these observations relate to the VISIBLE UNIVERSE, which is the volume of space we are able to observe using scientific instruments.

A "Big Bang" **type** event, as the source of all, or at least most, of the matter in the visible universe, is **generally** supported by SLT. However, there are many significant differences in the how such a process unfolds from the currently accepted model. These are presented by describing a hypothetical SLT "Big Bang" event.

The fixed energy content of the Lattice is in continuous motion. When waves in the Lattice cross, the strains of the Aas sum the wave values. Occasionally, there would be substantial dynamic events that produce large voids in the Lattice. These could be viewed as **cosmic earthquakes**.

The void could have dimensions on a cosmic scale. That is, SLT does not support that the Big Bang is produced by a singularity. Such bangs could also occur on much smaller scales. As the void opened, Aa's would float freely into the void off the exposed "free" edge zones of the Lattice and disperse through the void in random orientations. This void condition is called NON-CAPTURED since the near field volume around the free

floating Aas have no reference to the far field Lattice. Any matter, of any construction, including black holes or even entire galaxies, that are located near the edges of a void when it opens up, would dissolve into the void.

Due to the limit of the rate at which the Lattice can deform, a large void would take a long time to open. For an intergalactic scale event, the time would be distance divided by the speed “c”. SLT makes no suggestion as to whether it might measure in single digit years, or hundreds or thousands of years.

Such a void condition could not last indefinitely due to the prevailing pressure of the Lattice. Eventually, the void would collapse. The collapse would take an amount of time similar to the opening. The collapse would be violent as the edges could come together at speeds approaching the Lattice Relaxation Constant “c”. As the void collapsed, the Aas floating in the void would be pushed together again. This would start with a pressure increase in the free edge zones, propelling those zones into the void. As the edges came together, they would impact Aas along the way which would provide a counter force to the moving edges due to the inherent Newtonian inertia of the Aas.

Due to their shape, the Aas would start to reassemble as Lattice again along the imploding edges in a manner analogous to crystal growth. Due to the continuous collision of new Aas at the leading surface, many of the Aas would be caught in irregular orientations and structures. All the Standard Model fundamental particles could be produced along with many more. But, without the need to form the existing list of fundamental particles in SLT, the Aas could organize directly into neutrons, protons and electrons and then into atoms and build our visible universe. Unlike current “standard” models, the SLT model would essentially jump into the Big Bang process long after the singularity and without ever needing the singularity.

The collapse of the void would be accompanied by generation of a large rebound compression wave in the Lattice near the zone of impacting void edges. There is no reason to assume that the void would have spherical symmetry. The rebound would probably not appear to come from a single point, but rather a large diffuse volume with various wave sections emerging at different times. This would be similar in nature to

the “water hammer” event of a crashing surf, due to the inertia of the compressing Lattice. It could vary substantially from this, including being a running void. That means, the rebounding compression waves could be non-uniform.

The effect of introducing a hole discontinuity into the Lattice, which creates conventional matter, **lowers** the Lattice pressure around the discontinuity, and produces gravity. So a rebounding **high** pressure wave would create the equivalent of **anti** gravity wave. This would propel newly created matter particles and preexisting particles in the Lattice outside the void boundary outward from their original location in the void. The antigravity wave would expand from the rebound zone at the speed “c” due to the natural relaxation rate of the Lattice. Despite the force of the antigravity wave, particles would not be able to keep up with the wave.

As the expanding universe and its multiple gravity-antigravity waves settled down, the gravity fields from newly created mass would also be settling down. This means, gravity in an early “local” universe is anything but a stable phenomena. There could be mass forming near the “Big Bang” source who’s ESD has not yet reached mass formed earlier.

The SLT “Big Bang” model, which might be better described as a “Big Smash” model, has many advantages:

The creation of matter out of nothing is easily handled by SLT. Since matter is due to hole dislocations captured in the Lattice as it reforms, matter is essentially formed from the void as Aas come together and trap void volume as dislocations.

Energy is conserved in this process. The void can be considered to have been “endowed” with **potential** energy by the forces that opened the void. The “void potential energy” would be dispersed into the Lattice as the void collapses in the form of **lost volume** in the Lattice. This is the mass energy associated with each dislocation. It would be measured on cosmic scales as the integrated volume **lost** from the Lattice by the total number of dislocations formed.

Due to the preferred ways Aas align as the Lattice structure self-heals, very few anti-matter dislocations would be stable because they are harder to capture in the Lattice.

The SLT model, in contrast to the prevalent "Big Bang" model, does not require a balanced formation of matter and anti-matter.

There would be no need to alter any of the established laws of physics to explain the process. Specifically, there is no need to **overlook** the Big Bang = black hole problem which occurs if all the matter in the visible universe is starting from a very small volume.

There is no need to enlist dimensions beyond the three we can observe, or to change the size of the dimensions.

Since current physics still presents no physical reality for Time, it can't be changed in an attempt to explain the singularity of current Big Bang mathematics. SLT does not require any time alterations.

The "Big Bang" that is responsible for creating "our" visible universe, does not have to be unique. Instead, as Einstein suggested, it is more probable that the great universe is infinite in time and in all three dimensions. Given an infinite universe, Big Bang events are likely to happen randomly at all times throughout the universe. The implication of this is that the gravity waves they produce, both positive and negative, can course through space and affect, or even come together to trigger, other bangs. Since gravity is a speed limited dynamic process, our visible universe may be experiencing the effects of near-by Bangs, but not those of Bangs at great distance.

11.2 Micro Bangs

Previously, the response of the Lattice to particle accelerator experiments was discussed. Once an accelerator can provide large energies, they may have the ability to open up significant voids in the Lattice. This can be considered the equivalent of an SLT "Big Bang" on a micro scale. That would allow experimental verification of the SLT Big Bang model. The SLT Big Bang model also suggests that such experiments could be safe, because the Lattice would quickly heal without any fundamental basis for a critical mass runaway. For safety evaluation, accelerator experiments should be contrasted with the much more dangerous small void situation which occurs in Black holes as discussed below.

On the other hand, given that there appears to be no limit to how small an SLT Big Bang event can be, small events may be occurring frequently even within our visible universe.

11.3 Imbalance of matter and antimatter

Concepts in popular discussion about the "Big Bang" frequently raise the question about the substantial asymmetry in the universe between the quantity of Dirac matter (conventional matter) and "antimatter". The following summary appeared on the CERN antimatter webpage:

> "The Big Bang should have created equal amounts of matter and antimatter in the early universe. But today, everything we see from the smallest life forms on Earth to the largest stellar objects is made almost entirely of matter… Something must have happened to tip the balance. One of the **greatest challenges** in physics is to figure out what happened to the antimatter, or why we see an asymmetry between matter and antimatter." {28}

A variation on this view was discussed in an article in Scientific American:

> "Modern theories of particle physics and of the evolution of the universe suggest, or even require, that antimatter and matter were equally common in the earliest stages; so why is antimatter so uncommon today?... Without it, the universe today would certainly be a much less interesting place, because there would [should] be essentially no matter left around; annihilations would have converted everything into electromagnetic radiation by now. So clearly this imbalance is a key property of the world we know." {Barnett 2002}

SLT suggests multiple explanations for these imbalance challenges:

First, based on the SLT "Big Bang" model, matter and antimatter do not have to be produced in equal quantity. In fact, as the post "bang" Lattice reforms, the entrapment of "void" in the form of hole dislocations, which produces matter, appears to be much more likely, due to simplicity, than the entrapment of Aas as antimatter. For a hole to be formed, all that is required is the capture of Aas in irregular patterns during Lattice

reassembly. For an Aa to be captured as antimatter, a stray Aa would have to be correctly oriented and then forcibly inserted into already properly organized Lattice. So, in SLT, antimatter would be expected to have very low occurrence.

Second, photons can play a role that has not been previously understood or observed in physics as SCAVENGER PHOTONS**.** SLT suggests that low energy photons, which no longer have the ability to interact with conventional matter, can perfectly interact with SLT antimatter. The interaction results in destruction of both the photon and the antimatter particle leaving only prevailing Lattice and energy released as Lattice vibrations.

Figure 16-a below shows both the extra Aa (antimatter) from Figure 15-b and a dislocation (photon) near each other in a Lattice. The photon is moving in the direction of the antimatter. In undisturbed prevailing Lattice, the photon hole would just continue through the Lattice. But, the stress state of the antimatter inclusion would be higher than in prevailing Lattice. Referring to Figure 16-a, when the photon hole reaches the position just to the right of the speckled Aa, which is just to the right of the black antimatter causing Aa, the speckled Aa will begin to move right to fill the hole. It will move due to the pressure on it from its surrounding Aas, one of which is the antimatter producing Aa. But the antimatter Aa will also begin to move with the speckled Aa due to its pressure state. The woven textured Aa, itself under unusual pressure from the antimatter Aa distortion, would also move more quickly. As these three Aas begin to respond to the hole, a geometry arises that is different from the motion of a photon in typical prevailing Lattice as shown in Figure 16-b. The new situation is one of a restored prevailing Lattice, which is inherently **stable**, and resists further disruption. SLT suggests that this sequence of events will **not** occur when energetic photons encounter antimatter. In that case, the energy propelling the photon will override the self-organizing dynamics of the Aas. The photon dislocation will just pass through the antimatter, moving it one Aa width in the direction opposite to the photon motion. Once the photon energy becomes low enough, the self-organizing forces of the Lattice will overcome the photon energy and capture the photon. The antimatter causing Aa simply fills in the scavenger photon dislocation.

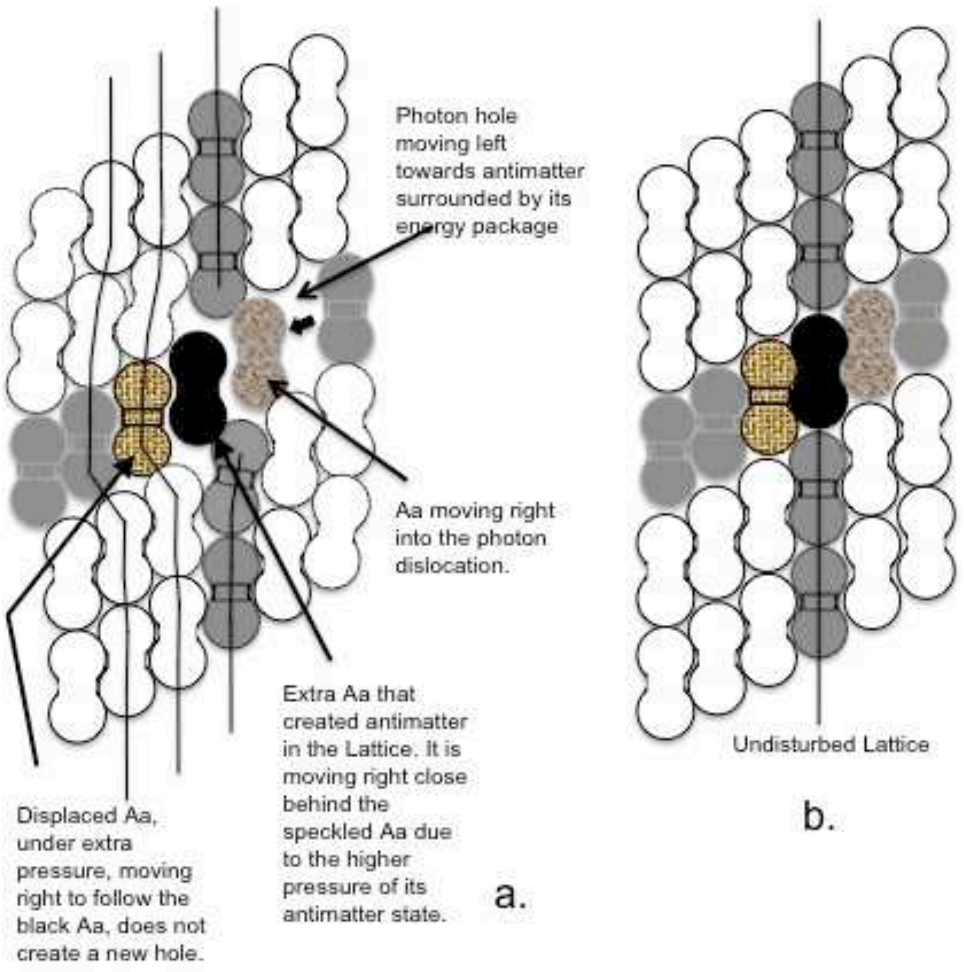


Fig. 16

Antimatter - photon annihilation

In short, SLT suggests that **scavenger photons** , which may alternatively be referred to as THERMAL PHOTONS, sweep the universe, clearing it of antimatter. This would contribute to an explanation for why so little antimatter is found. It would also suggest that the amount of antimatter will continue to decrease over time. The residual photon energy would then become microwave background, which would explain why so much of that **is** found.

If antimatter is associated with an additional Aa forced into the Lattice, a simple conclusion might be that the Lattice is entirely composed of antimatter. This, however, is not the case. This point is noted to stress that, in SLT, at the scale of the Aas, objects and interactions are **not** determined by specific items, like an Aa or dislocation, but rather by the effects caused by **arrangements** of the items. So, while an additional Aa in the Lattice, which disrupts the Lattice, produces the behavior of SLT antimatter – i.e. antigravity - the same Aa, when it is back in the structure of the Lattice, is no longer antimatter, but just the foundation of Lattice.

Another simple conclusion might be made that antimatter can be viewed as an "anti-**photon**". This is also not the case. While a photon and antimatter can annihilate leaving only energy, the antimatter Aa does not possess the "hole" property of a photon which allows it to so easily pass through the Lattice. On the other hand, if it could move through the Lattice, it would carry the ability to transfer mass, albeit in the form of antigravity antimatter.

SLT suggests a reason so little antimatter is found is that science might have to question the basic observations behind the antimatter challenge. Because of the "framing" of the term "antimatter" to apply to an **electric charge reversal** of predominant particle forms, rather than **gravitational reversal**, the search may be wrongly constraining. Given that antimatter, in the form discussed previously in the section on gravity, would **repel** common matter, three unexpected phenomenon result:

1. Antimatter particles could co-exist along side matter, with no affinity to collide and annihilate.

2. While single Aa antimatter particles would be attracted to each other, their structure may not support development of complex particles which parallel

neutrons, protons and electrons, or even the Standard Model particles. The "thermalization" of space by matter may be sufficient to keep the primitive antimatter in the form of a "gas" or antimatter "plasma".

3. Current physics does not have tools or models to detect this form of antimatter. So, there would not have been efforts that could quantify how much there is.

And finally, while there is an Aa configuration that produces antigravity, it is so different in geometric structure from the geometry that produces matter, it is unlikely to produce a collection of antiparticles that are anything like a mirror image of the Standard Model of particles.

11.4 Dark Matter, Dark Energy

The same occurrence asymmetry questions raised for antimatter could apply to the absence of "antigravity. " Antigravity would be more discussed if alternative models for the functional production of antigravity existed. The only broadly accepted antigravity model is "universal expansion" in relation to the prevailing "Big Bang" theory. But this model provides the wrong geometry to explain other observations which beg antigravity solutions, such as the geometric rotational uniformity of galaxies, rather than a Newtonian gravity rotation that decreases drastically with distance.

Current discussions of a universally dispersed antigravity have led to the concepts known as "dark matter" and "dark energy". A discussion of these concepts is provided on the CERN Dark Matter webpage:

> "Dark energy makes up approximately 70% of the universe and appears to be associated with the vacuum in space. It is distributed evenly throughout the universe, not only in space but also in time – in other words, its effect is not diluted as the universe expands. The even distribution means that dark energy does not have any local gravitational effects, but rather a global effect on the universe as a whole. This leads to a repulsive force, which tends to accelerate the expansion of the universe." {14}

SLT suggests that the occurrence of thermal photons and antigravity Aa inclusions, as discussed in previous sections, might provide mechanisms to answer the still unsolved gravity distribution questions and lead to approaches to detect SLT photons and antimatter. For example, the concept of thermal photons opens up the possibility that many of them might agglomerate. Without atomic structure, they would group into very small objects, entirely bonded by gravity. They would not be visible in the conventional sense because they would be so small, and because they would not absorb or reflect light.

11.5 Big Bang and gravity waves

In the discussion of gravity waves, it was mentioned that a Big Bang event might offer an alternate source of strong waves for gravity wave detection. SLT suggests that very strong Lattice distortions occur during a Big Bang event, as a large space void is produced and then closes up. The distortions would thereby create very large gravity waves, initially as antigravity due to the compression of the Lattice during void expansion, followed by a gravity overshoot as the void collapses. The initial waves would be followed by many echo waves, each with lower magnitude, finally settling into a normal gravity residual state representing the mass created during the process.

Such gravity waves, caused by numerous Big Bang events beyond our visible universe, would travel through the great universe crossing visible universes and thereby be capable of detection. They would appear to come from super large explosions. Their period, however, would be very long, on the order of the visible universe formation time. This would be approximately the maximum void radius divided by the Lattice relaxation rate “c”.

11.6 Black holes and antimatter mirrors

Black holes

It is important to start the discussion of black holes with a clarification of the $1/r^2$ relationship for gravity in the previous discussion titled “Gravity vs. distance”. Using

Newton's Shell Theorem, the gravity field magnitude at the center of a black hole is **zero**. It is not infinity as many current models state. This also brings into question the possibility of an "event horizon", also referred to as the SCHWARZSCHILD RADIUS ($r_S = 2\ G\ m/c^2$) (S-r). While the S-r can be calculated for all collections of matter, the question becomes, is the gravitational field of the matter within the S-r capable of compressing the structure of the matter within the S-r sufficiently to achieve the required mass / volume ratio. Since the Shell Theorem shows that gravity decreases with depth within spheres, the compression of material has to come entirely from the gravitational effect of the "overburden".

Typical examples simplify the calculation by using the assumption of uniform density. For example, using matter with the density of water, a Schwarzschild radius occurs when an object reaches 136 million solar masses. Objects estimated at over 10 billion solar masses have been observed. {McConnell 2011}

Considering the SLT model for a black hole, an interesting picture emerges. The black **hole**, while observed as an agglomeration of dense **conventional** mass, is also a collection of holes, due to the SLT model that mass is due to dislocations. This, ironically, produces a low Aa density Lattice structure inside the object (being filled with holes), surrounded by the higher density Aa structure of less-perturbed space. Photons, which transport mass, would be directed by the gravity of the black hole toward its center. According to Newton's Shell Theorem, the center of a black hole would have no gravitational field. That is, the Lattice at the center of the black hole would not be gravitationally distorted. Instead, it would appear like a Lagrangian libration point – a BLACK HOLE LAGRANGIAN (BHL). Such a structure could initiate a multi-step process:

BHL initiation - step 1:

Assume that the dislocation of photon 1 has come to rest at the BHL as shown in Figure 17-a below. The speckled Aa to the right of the hole becomes the last available Aa to the right of the hole to propagate the arrival of another photon hole from the right.

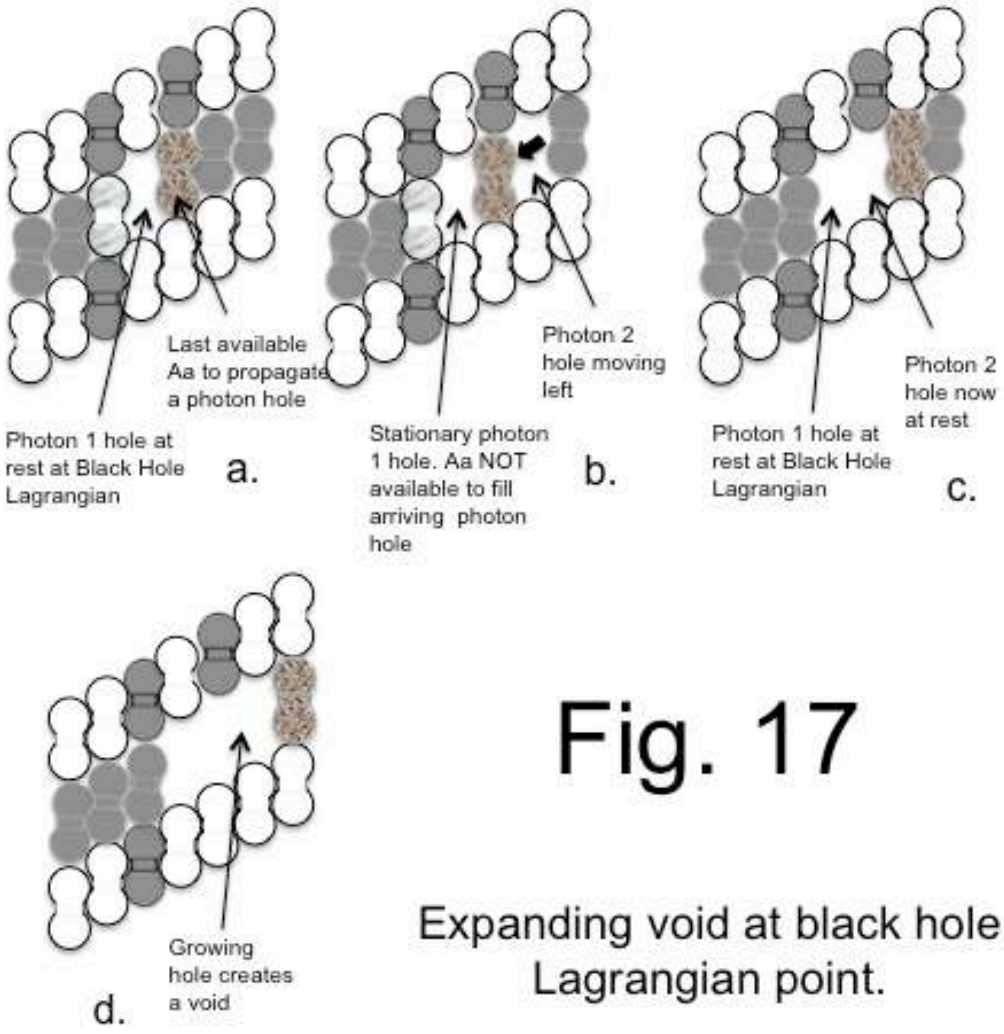


Fig. 17

Expanding void at black hole Lagrangian point.

Photon destruction – step 2:

In Figure 17-b, photon 2 is shown arriving from right to left. When it collides with the last remaining Aa in its path before encountering the stationary hole, the photon hole exchanges places with the last Aa resulting in the geometry shown in Figure 17-c. Since there is no Aa available for continued motion, the photon is destroyed and its energy packet released into the Lattice as thermal energy.

Void creation – step 3:

Figure 17-d shows the result of photon 3 arriving. It has also caused the speckled Aa to move again. Since Aas are not available to propagate photons through the BHL, a BHL **void** would form and grow as continued photons arrived.

Void collapse – step 4:

Voids are not a stable Lattice structure. The Lattice would eventually **adjust** to fill the void by pushing Aas into it. This would cause at least the following 8 outcomes:

Effects in the surrounding Lattice

1. Lattice bending: The Lattice could bend into the void. That would increase the gravity field around the BHL and attract more photons and mass to the void.

2. Void edge collapse: Aas near the void edge would be pushed into the void by the pressure of void-edge Aa rearrangement.

3. Photon production: If an Aa is energetically pushed into the void, a new "rebound" photon going outward in the opposite direction will be created. Due to the gravity field and mass density, the photon would eventually scatter back into the BHL.

4. Matter migration: Matter in the form of atomic particles or subatomic fragments could enter the void. Their arrangement of dislocations and associated Aas would be lost as the near field structure of the particle entered the void. Their dislocations would enter the void expanding it.

Effects in the void:

5. Void structure: The void has no gravity field. Aas pushed into the void just move around due to the inertia of the event that caused them and thermalization with other Aas. The void would be dynamic and remain relatively small.

6. Destruction of mass and matter: When "mass" enters the void, ironically, all that actually enters the void is the dislocations. That is, the "mass" effect is just the accumulated distortion in the Lattice produced by the dislocations. So as a "mass" moves toward the void, the Aas structure that defines the mass adjusts, but the Aas don't move with the dislocations. This is similar to waves on water. The water adjusts but it does not move with the waves. So, ironically, as "mass" (i.e. dislocations) enter the void, the void grows, just as it does for photon capture.

7. Matter creation: Multiple Aas falling into the void could be trapped in odd arrangements, forming both stable and unstable particles. The particles, each of which must include a dislocation, would be ejected into the Lattice becoming new components of the black hole. However, due to the local gravity and mass around the BHL, this created mass will typically scatter back into the void.

8. Lattice healing: Due to the self-organizing property of the Aas, many of the Aas that enter the void from its edge will re-organize into undisturbed Lattice.

This model produces a interesting outcome. The result of steps 1-4 is that a BHL void creates a conveyor belt of inflowing dislocations from photons and matter. The inflowing matter and photons would essentially be torn apart and the misalignment of the Aas that defined their matter would eventually be returned to a Prevailing Lattice structure – i.e. converted back into Lattice. As the matter of a black hole is converted back to Lattice, the gravitational field of the black hole would decrease. This process could continue until the black hole wasn't "black" anymore if there was **insufficient** influx of matter and photons to sustain the BHL.

The concept of thermal photons opens up a new possibility for black holes. If thermal photons can assemble into small objects, many might agglomerate, without atomic

structure, into very heavy objects. Due to the lack of atomic structure, the mass of these objects could be huge in proportion to their size, far exceeding the density of neutron stars, for example. They would be invisible through conventional light sensing methods.

In summary, SLT suggests that a black hole, through the mechanism of the BHL, becomes an annealing furnace to turn matter back into Lattice. SLT therefore suggests that black holes are a process that destroys what Big Bangs create.

A corollary is that the mass of black holes has a finite limit which occurs when the BHL annealing rate balances the black hole matter plus photon capture rate.

Antimatter Mirrors

SLT suggests an explanation for the phenomenon of antimatter, which was discussed in the previous section on gravity and antimatter. While antimatter does not appear to be able to form anti-atoms, SLT suggests that antimatter does appear to have a stable structure in the bare Aa form. But, unlike the force relationship between electrical charges, among which opposite charges attract and similar charges repel, conventional matter is known to attract matter like itself. As described in the section on gravity, SLT suggests that antimatter will also attract antimatter similar to itself. So, given its possible stability and affinity to attract like material, there might be cases for an agglomeration of antimatter to form. If such an agglomeration were to occur in a very large amount, it might seem obvious to describe it using a term opposite to a "black hole" such as a "white hole". This would be misleading.

Here are some properties that SLT suggests a very large antimatter object might have:

1. Its gravity field would be "antigravity" rather than "normal gravity" as we see with a black hole.

2. Antigravity would **repel all conventional matter** and only attract antimatter objects like itself.

3. It would repel conventional photons. It would repel conventional electromagnetic waves.

4. With sufficient material, it would also have a Schwarzschild radius. At that radius, no conventional photon or any conventional object could penetrate its "event horizon".

There is a phenomenon in the physics of light, related to reflection, that states, objects that are insulators, such as porcelain, reflect light predominantly in wavelengths related to their own chemistry. Objects that are conductors, on the other hand, such as mirror surfaces, reflect images predominantly in wavelengths related to the source light's color. With this model, the use of black and white to distinguish super massive objects is misleading. The "anti" version of a "black hole" would be better described as an ANTIMATTER MIRROR.

Looking for one in space, we should be looking for a small perfectly silvered sphere. It would be relatively small in diameter because the antimatter Aas would not appear in atom sized form. So they would agglomerate as bare photon sized "particles". The object would appear as a "fisheye" mirror that presents us with a spread out view of the universe behind us, although through an aperture only the size of its gravity field out to a range capable of diverting passing light rays.

If we relax the requirement of having sufficient material to achieve a Schwarzschild radius, what other properties would a sizable antimatter object have?

5. It could exist at sizes much smaller than required to produce an "event horizon".

6. It would be subject to substantial erosion by scavenger photons and therefore have a relatively short lifetime.

7. It would not easily collide with conventional matter, but push away from conventional mass.

8. It could easily pass through collections of conventional mass like galaxies without collisions. (This sounds suspiciously like a neutrino? For fast moving single Aas, they also beg to be seen as antiphotons?)

9. If it passed through interstellar clouds, it could leave “contrails” of swirling eddies.

10. It could exist as a binary with another antimatter object or form galactic type structures.

11. These “antigalaxies”, while not being able to emit conventional photons, would be able to emit electromagnetic waves, including some into the visible and higher frequencies.

Theoretical SLT observation summary for black holes and antimatter mirrors

1. The magnitude of gravity at the center of a black hole is zero, not infinity.

2. Even at the highest levels of gravity near the periphery of a black hole, that level is limited by the ability of the Lattice to bend without breaking its structure, which would just result in a Lattice reorganizational process.

3. Black holes may have a Black Hole Lagrangian at their center.

4. The BHL may enable a process that turns the matter of the black hole back into regular Lattice.

5. The BHL may in fact exist in mass concentrations below the amount needed to create a Schwarzschild sphere.

6. The mass of a black hole is finite. As the concentration of matter increases in density, the efficiency of BHL processes at its core to convert mass to Lattice will improve and limit its growth. The mass of a black hole is the integral over time of the balance between matter and photon influx vs. the BHL conversion rate.

7. As a steady state mass eater, black holes just reverse the process of visible universe creation in a great universe of cyclic Big Bangs and black holes.

8. Since a large antimatter object would repel conventional matter, including photons, and electromagnetic waves, such an object would appear as a mirror in

space. The diameter of the mirror would depend on the gravitational field strength of the object.

9. If the object had a Schwarzschild radius, no object or photon could penetrate its event horizon. It would become a perfect mirror for conventional objects, including photons.

10. Antimatter objects could exist at sizes smaller than black hole equivalents. They would easily pass through collections of conventional mass and would repel conventional mass as they passed.

12 Electromagnetics

12.1 Electromagnetics introduction

SLT suggests that the forces physics describes as electromagnetic are caused entirely by the interaction of **structural bending distortions** in the Space Lattice. Electric, magnetic and gravity **fields** are three distinct but overlapping forms of Lattice **bending** distortion. The fields extend from their source, outward, indefinitely through space. The fields, as encountered in space, are the vector sum of individual fields produced, simultaneously, by **all** the material sources in the universe. All three fields, while distinct and topologically different in structure, are distortions of the **same** Aa Lattice. They **do not** rely on different fundamental universal constituents.

It is this observation about the Lattice, with additional points to come, that provides a new basis for the unification of all physical phenomenon.

ELECTROMAGNETICS is a term that categorizes phenomenon referred to in physics as electrostatic **fields**, electromagnetic **fields**, and the behavior of electric charges and magnetic dipoles in those **fields**. These fields interact with charges and magnetic monopoles in the manner we interpret as an electric force or magnetic force. While **all three** fields (gravity, electric, magnetic) are distortions in the **same Lattice structure**, that is, as **structured distortions** of **Aa relationships**, the manner in which the fields interact with hole dislocations, charges and magnetic dipoles, is completely different.

A new term "ELECTROMAGNETIC CHARGE"(EMC) is suggested to replace the conventional term "electric charge" because SLT suggests that a creation of the source of conventional electric charge simultaneously creates and includes a **magnetic monopole**.

EMCs and "magnetic **sources**" are caused by a **newly proposed** description of matter caused by a complex multiple hole dislocation pattern that produces a **twisted field** in the Lattice. The pattern is referred to in this paper as a LATTICE TWISTING STRUCTURE **(**LTS**).** The "twisting" occurs when an electromagnetic particle is created. Lattice Twisting Structures occur in two general forms: plus and minus. Each of these

occurs in both static and dynamic forms. It is important to emphasize that, the dislocation structure needed to create the LTS is distinct from the dislocation structure that creates the property of mass for a particle. The modifier “sources” is used here to qualify the term “magnetic” because SLT suggests that both magnetic dipoles and magnetic monopoles can exist.

Electromagnetic distortions in the Lattice can be observed in 5 general forms: 1. “Electromagnetic charge” (static); 2. Magnetic monopoles (static); 3. magnetic dipoles (static), 4. electric waves (dynamic) and 5. magnetic waves (dynamic).

Electromagnetic charge, magnetic monopoles and magnetic dipoles are designated “static” if their vector position, orientation, and magnitude are unchanging in the Lattice. In their static form, these three Lattice distortions produce distinct stationary **fields** in space that cause forces to appear on other charges and magnetic dipoles. While dipoles can produce a “static” field, they are complex phenomenon because, to exist, they must be continually replenished by a dynamic circular flow of electric charge.

Electric and magnetic **waves** are dynamic, meaning they can only occur as moving waves. In rare cases, multiple waves of similar wavelength may pass in opposite directions creating standing waves. Electric and magnetic waves are both produced, as a simple process, by the change in location and orientation of their sources. However, because the source motion can be complex, the waves can also be complex. Also, since the ability of the Aas to adjust is rate limited by the LRR, if the sources move fast, the fields would distort severely as the sources approached the speed “c”.

Concerning the relativistic formulation of conventional electromagnetic principles such as Maxwell’s and Faraday’s laws, the interaction between fields and between a field and matter will appear to be entirely subject to the **relative** velocities of the interacting fields as long as the sources that are generating the fields are moving at low velocity in the Lattice relative to the Lattice relaxation constant “c”. As the sources generating either one or both fields approach “c”, the field shapes adjust accordingly and that shape change must be accounted for in their interaction in ways not anticipated by Einstein, Lorentz or any of the classical scientists. Unlike the Einstein thought experiment where he tried to envision what a light beam would look like if viewed from another light

beam traveling parallel to it, SLT suggests that the answer for matter, waves and photons must each be described differently as expected for a stationary Lattice.

In prior sections, SLT suggested that photons are pulses associated with hole dislocations, and not waves. To clarify this more precisely: SLT suggests that not all electromagnetic phenomenon have a common foundation, as is assumed in classical physics. That is, the phenomenon conventionally referred to as "electromagnetic waves", are **not** one continuum of a single phenomena, as is the prevalent scientific model. This single continuum assumption is what resulted in the false dualism problem between wave and particle theories. SLT suggests that the phenomenon referred to as photons and thermal radiation, are distinct from the phenomena known as radio waves and distinct from each other. This creates a four-fold subdivision of the phenomenon for spatial energy transport. The specific discriminators for these phenomenon are not wavelength, but:

a.) photons, which have the ability to transfer mass and convert energy to **mass** through **nuclear** changes. Photons were discussed previously in section 7.

b.) electro-statics, where the local twist of the Lattice long-structure lines is small so the lines remain approximately parallel.

c.) electro-magnetic fields, where the local twist of the Lattice long-structure lines is large due to mutual reinforcement so they appear to form closed loops around the source. Radio waves are electro-magnetic.

d.) thermal waves, which are a pure mechanical bending of the Lattice which is propagated as waves.

SLT provides a theoretical foundation for showing how each of these transfers energy to the other forms and to matter.

12.2 Electromagnetic charge (EMC)

An EMC is not an infinitesimal point. It has finite volume. This volume may measure many Aa length on each side, but probably is not as small as one Aa or even just a few Aa lengths on a side.

SLT suggests that an electromagnetic charge exhibits both electric and magnetic properties. During charge creation, adjustments of the Aas in the Lattice introduce **twisting** in the Lattice which introduces **sheer stress** in the Lattice. This twisting is referred to as a Lattice Twisting Structure (LTS). The term "**twist**" means that, related to a single electromagnetic charge, the Aas along various long-structure paths passing through the charge's SSDV are wound CW around a virtual "axis" in the charge, while Aas along other long-structure paths passing through the same SSDV are wound CCW around a **different** point on the axis. The torques net to zero in the far field thereby not introducing a net torque on the Lattice. The result is that the LTS creates a sheer stress in the Lattice with a net Aa **density** change of zero. In contrast, a "mass", creates an Aa density gradient, but no sheer stress. This difference allows the two fields to cause distinct effects in the Lattice while overlapping in geometry.

The twisting imparted to the Lattice can have two distinct (bi-polar) helical forms when viewed along the charge axis: clockwise and counterclockwise. These distinct forms produce the positive and negative presentations of the electric field and the north and south presentations of the monopole magnetic field.

SLT suggests that the EMC does not conform to a classical electric source model. Neither its electric nor magnetic field radiates spherically. The electric field can more appropriately be viewed as a diverging PANCAKE FIELD while the magnetic monopole field can be viewed as two end-to-end FUNNEL-FIELDS. These are shown as **functional depictions** in Figure 18 below. This depiction is not an attempt to show the Aa structure that produces the LTS function, or the Aa structure that produces the mass associated with the charge. Figures 18 a-h also only show a depiction of the **near field** function. Figure 18 –I depicts the far field structure.

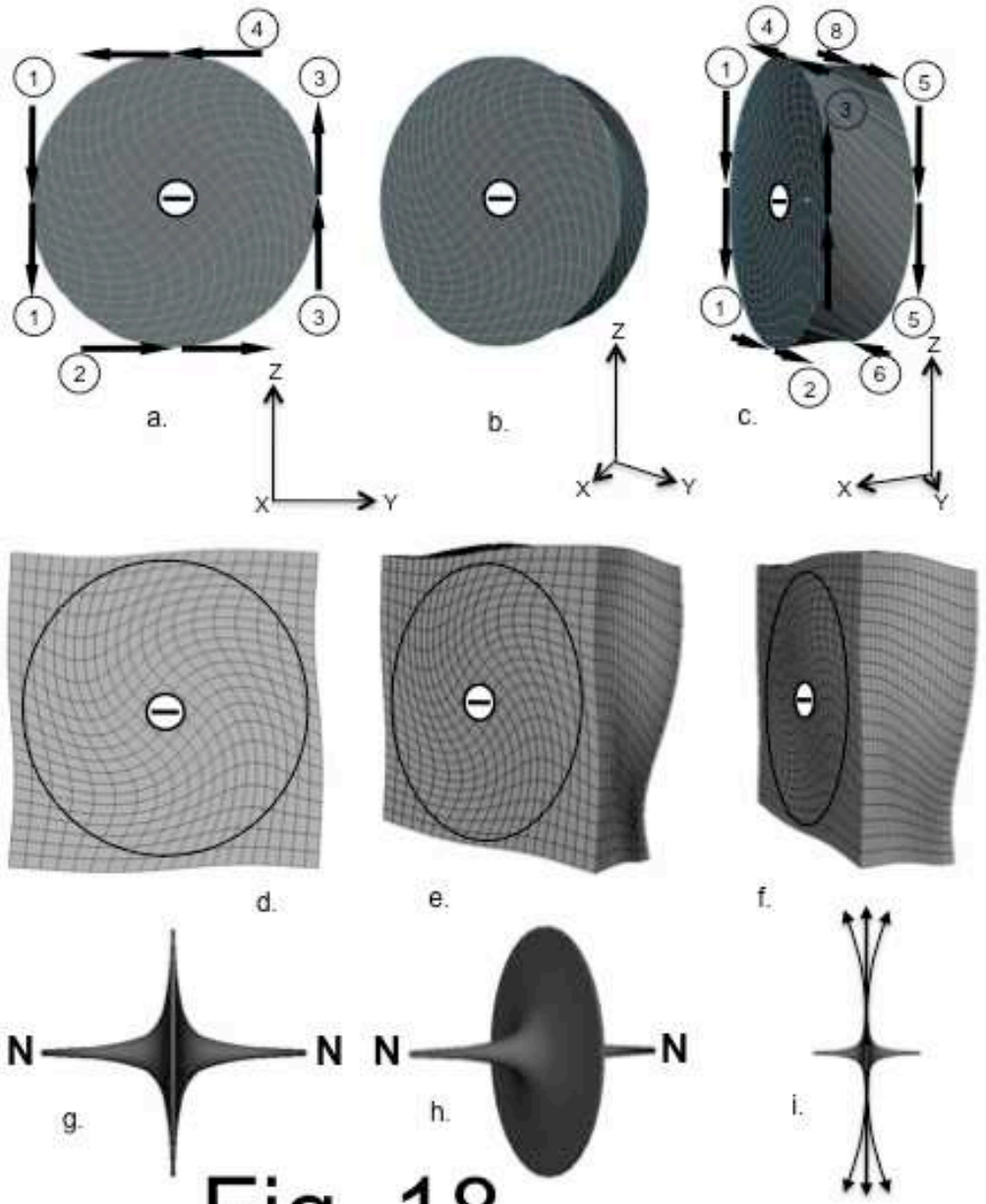


Fig. 18

Electro-magnetic Charge -
Functional Perspective Views

The depictions of the electromagnetic charge show a “pancake” like geometry. This is intentional. SLT suggests that charges do **not** have spherical symmetry. Figure 18-a shows a view of the particle’s SSDV (Source Structure Distortion Volume) directly along an X axis, which will be used to define an axis that is axially symmetric with the disk of the pancake. Figure 18-b shows the “a” view rotated about -20 degrees around Z. Figure 18-c shows the “a” view rotated about -60 degrees around Z . It is important to stress that the pancake shape is **not** a suggested hard volumetric shape for a charged particle. No hard boundary exists in SLT for any particle. SLT **does** suggest, however, that the pancake geometry is an accurate functional portrayal of an SSDV for an electromagnetic charge.

Figure 18-d shows a depiction of part of the Lattice directly along the same X axis as shown in Figure 18-a that was a rectangle prior to twisting. A circle is drawn on the Lattice to show a projection of the SSDV in the Lattice in which the distortions that create the charge are located, projected on a Lattice plane parallel to the Y-Z plane. Figure 18-e shows the “d” view rotated about - 40 degrees around Z . Figure 18-f shows the “d” view rotated about - 60 degrees around Z. Again, circles designate a projection of the influence volume.

All six views show a negative sign at the center of the pancake circle projection. It will later be discussed that the CCW twisting structure is consistent with what is classically called a negative charge.

The surfaces of all 6 views depict the long structure lines of the original rectilinear Lattice which have been “twisted” during the charge’s creation process. The twisting occurs around the X axis, in this case shown in a counterclockwise direction on the nearest visible section plane. The amount of twisting in the figures is, potentially, exaggerated to allow easier visualization of characteristics of the charge’s function. SLT does **not** suggest a specific angular magnitude of the twist.

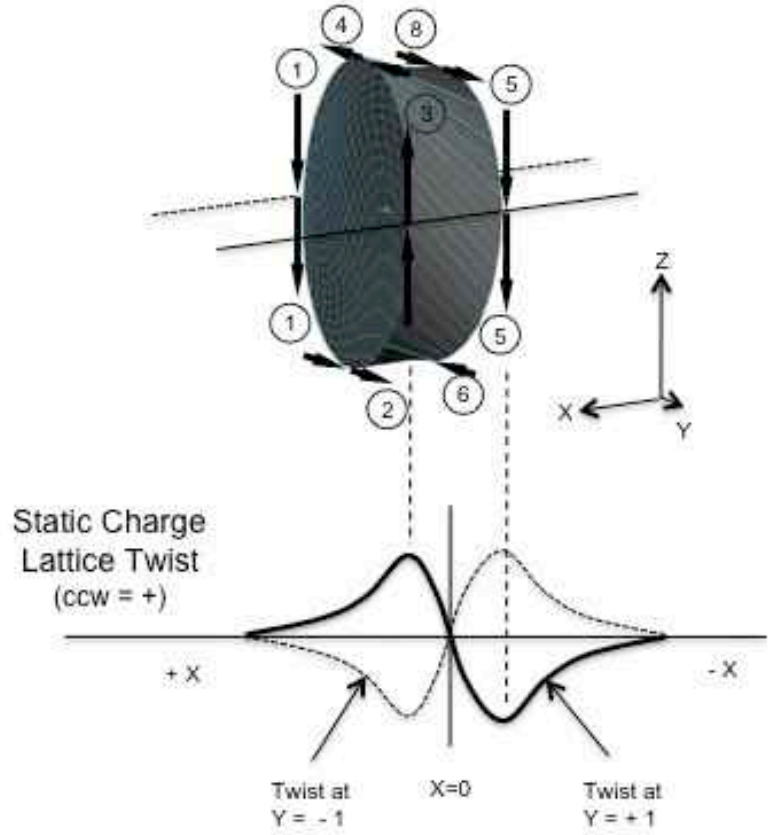
The twisting geometry in the figures was created by selecting a 3X3 set of surface Lattice cell faces at the center of the +X face and rotating them 45 degrees counterclockwise. The Y-Z edges of the Lattice cells were given elasticity in length sufficient to cause the Lattice near the projection circle to show a small twisting effect.

The edges were constrained at intersections with spline fits. The elasticity in the X direction was set to cause a volumetric distortion that extended about 50% of the pancake thickness. The pancake was then flipped 180 degrees around the Z axis and the process repeated on the –X face.

The result of this process was to create a pancake shaped SSDV that is axially symmetric around the X axis and which exhibits a **counterclockwise** twist when viewed from **both** the +X and –X axes.

The long-structure impact of the creation process can be described using the numbered arrows. In Figure 18-a, the arrows numbered 1 indicate that the Lattice long-structure at the left (-Y) side of the front (+X) face has been pulled down (-Z). The arrows numbered 2 indicate that the Lattice long-structure at the bottom (-Z) of the front (+X) face has been pulled right (+Y). The arrows numbered 3 indicate that the Lattice long-structure at the right (+Y) side of the front (+X) face has been pulled up (+Z). The arrows numbered 4 indicate that the Lattice long-structure at the top (+Z) of the front (+X) face has been pulled left (-Y). While the twisting is described using 4 rectilinear "vectors", the elasticity of the Lattice and the structure of the SSDV will produce a uniform circular distortion of the Lattice.

These displacements of the Lattice long-structure would introduce a twist in the Lattice most strongly in the Y-Z plane coincident with the +X face. The twist would extend indefinitely in space with decreasing magnitude. In rotated Figure 18-c, arrows numbered 1-4 match the arrows shown in Figure 18-a. However, in the Figure 18 -c view, arrows numbered 5 show that the structure at that location (-X, +Y) is pulled down. The other arrows on the –X face, numbered 6-8 (7 not visible) in counterclockwise order, viewing that face surface from the –X axis, show that a twist would be introduced into the Lattice structure by this face as well, also in a Y-Z plane, that twist being strongest coincident with the 5,6,7,8 –X plane. In Figure 18-c, the graphic shows that a torsional sheer is created in the Lattice between the +X and –X circular faces. Since the long-structure elements for the numbered arrows are also displaced, the torsional sheer also extends indefinitely.



The twist magnitude curves are aligned as if the view was directly along the Y axis.

Fig. 19

Static Electro-magnetic Charge - Lattice distortion function

The magnitude of the twist vs. the EMC geometry is depicted in Figure 19 above. The magnitude curve shows that along any line parallel to the X axis which passes through the SSDV, the Lattice experiences a twist distortion related to the orientation of the charge. The magnitude of the twist would be consistent with the $1/r^2$ field falloff of classical physics in the **far field**. As a torque meter moves along the axis from either direction, the torque would increase in a CCW direction for the depicted charge, reaching a maximum at some small distance from the X=0 plane (possibly coinciding with the near field transition). The torque would then drop to zero at X=0; it would then rise in a CW direction and reach a maximum at a symmetrical small distance from the X=0 plane; finally decreasing to a small value again in accordance with a $1/r^2$ falloff along -X. Notice that, for a static charge, the net torque on the Lattice in the far field in all directions is zero and the density gradient of the Aas is **not** changed.

Figure 18-g shows a depiction of the electromagnetic charge SSDV as viewed from the far field in the Y-Z plane. Figure 18-h shows the "g" view rotated about 45 degrees along any radial perpendicular to the X axis. The disk is the planar torsional stress field that we interpret as an electric field. The spikes protruding from the disk are rotational torsional stresses that would be interpreted as a monopole magnetic field. Note, both spikes have the same magnetic polarity because they have the same twisting direction when viewed from either +X or –X. A script "N" indication is shown for these monopole projections. It will later be discussed that the CCW twisting structure observed from either extension of the X axis will produce the behaviors consistent with what is classically called a North pole. Figure 18-i shows a sectional view of Figure 18-g with extension lines to indicate how the far field structure might appear. The far field spreading rate of the torque effect in the X axis direction approaches a $1/r$ asymptote, so that the field strength at any point in the Lattice decreases at the rate of $1/r^2$. This is dictated by the elastic nature of the Lattice, not by anything the SSDV can do.

To summarize, the electrostatic pancake field is created by taking two small closely spaced parallel planar Lattice sections which sandwich a small volume of Lattice and twist the sections in opposite directions. The twisted volume appears as a twisted flattened circular pancake in the Lattice. Long-structure Lattice lines pass through the section and extend to infinity. Due to the Lattice structure, each long-structure line

passes through the section at a different radius from the axis. When the section is twisted, long-structure lines farther away from the axis receive more linear twist out to some maximum influence radius. Beyond that the linear twist decreases at the Lattice rate of $1/r^{2.}$.

Viewing the pancake perpendicular to the axis, after the long-structure lines leave the SSDV, they start spreading evenly in the +X and –X axis direction approaching a rate that produces a $1/r^2$ magnitude falloff. This is shown in Figure 18-i.

The magnetic monopole funnel fields start as the far field long-structure lines on the +X and –X surfaces of the electromagnetic source pancake, spiral radially inward and turn axially outward exponentially collapsing to a single line that defines the axis for the source charge as shown in Figures 18-g, h.

Charge interaction

In conventional physics, electric charges of the same polarity are observed to repel each other. It is assumed this property is spherically symmetric, in keeping with a Bohr model spherical structure for electrons. A mutual, spherical repulsion property for similar polarity electromagnetic charges is also suggested by SLT despite their non-spherical shape.

Consider the interaction of two similar polarity electromagnetic charges being brought together. The pancake geometry creates six general cases:

- case 1 where the axes of the two particles are coincident;
- case 2 where the axes are parallel, but not coincident;
- case 3 where the axes are oblique but co-plainer;
- case 4 where the axes are skew;
- case 5 where the axes are perpendicular and the center of one charge lies on the axis of the other;

- case 6 where the axes are perpendicular but neither axis passes through the other charge.

For case 1, referring to Figure 18-i, note that the pancake twisting structures extend outward indefinitely and do not have a sharp cut off as shown in the other Figures 18a-h. Due to the spreading field, eventually, at some distance "r", the "fringe" fields will overlap. Because the Lattice twist direction for both charges has the same rotational direction between them, bringing the far-fields of the pancakes together will increase the torsional stress in the Lattice as a whole. This will add energy into the Lattice in the form of Aa compression. The increased force required for the additional Aa compressions will resist the merging of the fields, thereby exhibiting a repulsion. For case 1, the magnetic pole fields also rotate the Lattice in the same direction. As they are brought together, their interaction would be to twist the entire electric pancake fields of both charges. The resistance of the Lattice to the additional twist would be reflected as a repulsion.

For case 2, the interaction of the electric fields are the same, just more complex due to the center of rotation asymmetries of the fields. The interaction of the magnetic poles becomes additionally complex because the pole magnetic field of each charge causes an electric field rotation in the other charge's field. Consider two charges A and B. The rotation in the magnetic field is largest closest to its source. So the magnetic field of A will produces the greatest twist in the electric field of B where the X axis of A crosses the field of B, and in the plane of B closest to A. This essentially causes the twist of B's field to increase. The Lattice will resist this and the forces will reflect between the charges as a repulsion along X. In addition, the asymmetry in r will result in the charges trying to increase r.

For case 3, the far-fields must fully cross at some point. This crossing will act to force the axes of the charges to align, thereby duplicating case 2. If additional charges prevent such an alignment, the crossing fields will still result in additional overall twisting in the Lattice. As the charges are brought closer together, far-field regions of greater twist will reinforce each other, adding additional twist into the Lattice. The resistance of the Lattice to twisting will result in a repulsion between the charges. The interactions of

each component, electric and magnetic, are similar to case 2, but complicated by the added asymmetry due to axes angular variation between the X axes of the two charges.

Case 4 is similar to case 3 with the added asymmetry due to 3-D angular variations between the X axes.

For case 5, the electric field of one charge, A, cleaves both the electric field and magnetic field of the other charge , B, through B's center. This creates a distortion of both B's electric and magnetic fields similar to the magnetic field interaction description of case 2 because, edge on, the electric field appears to be a rotational torque around a line between the centers of the charges.

Case 6 is a variation on case 5, where the electric field of A in case 5 appears as a magnetic field, which distorts the electric field of B.

The interaction of a negative and positive electromagnetic charge can be understood by reviewing the six cases for the similar charges discussed above, but noting that in each case, the interactions of the fields act to reduce the torsional stress in the Lattice. That results in forces that would bring the charges closer together.

The pancake geometry of the charge creates the following properties.

The net torque in the universe introduced by the shear distortions is zero. The net density change due to the creation of the shear field is zero. Charges occur in bipolar form depending on whether the twisting is clockwise or counterclockwise. The torsional shear field between the virtual face planes of a charge produced by the twisting, is a radial pancake in the near field. SLT suggests that the shear stress is the electric field that conventional physics associates with charges.

The torsional field that extends outward along the X axis from the face planes is a pure twisting field. This is the monopole field of the particle. Since the twist appears in the direction of the rotation of the face when viewed toward the charge, the magnetic field polarity looking at the charge from either the +X or –X direction appears the same. The monopole is formed from a distortion of the Lattice, which can be viewed as having a rectilinear like structure. The implication of this is that, while the magnetic field can be

"visualized" in the form of flux lines, they are only visualization conveniences, like elevation lines on a contour map.

Electromagnetic charge – static and confined fields – capacitance

Consider many negative electromagnetic charges that have been forced onto a very thin flat wire. The wire is wide enough to allow charges to separate horizontally (Y axis) but not vertically (Z axis). SLT suggests that the charges will align with each other. They will space themselves uniformly due to the mutual repulsion of their electric fields based on the conductivity and geometry of the medium they are in. This arrangement is depicted in Figure 20 below. Only the near field portion of the charge is shown in Figures 20 a-c. Figure 20-d shows a far field section view. The lines in this figure represent the central "neutral" twist plane for each charge. Due to the mutual repulsion of the negative charges, the far fields, which each spread out with distance as depicted in Figure 18-i will spread into each other and force additional bending of their fields.

In Figure 20, there are 3 section views of the wire. Section a. shows a view along the "axis" of the wire. In this view, the charges are aligned so their "pancake" geometry is "face on" as shown in Figure 18-a. As seen from side view b. the charge "pancake" geometries align. In the bottom view c. the charges can be seen to push toward the edge of the wire to minimize their concentration. This behavior is referred to as "skin effect" in electronics.

Now consider bringing two of these wires together to form a parallel plate capacitor. This arrangement is depicted as an end-on section view in Figure 21. During the process of "charging" the capacitor, negative charges will be driven into the upper plate. When this occurs, the fields of those negative charges will drive an equal number of negative charges out of the positive plate. This, in turn, will unbalance the electrostatic equilibrium of the atoms on the positive plate, leaving a surplus of positive fields from the positive charges (protons) in those atoms. The positive charges will be aligned in a similar positive charge arrangement.

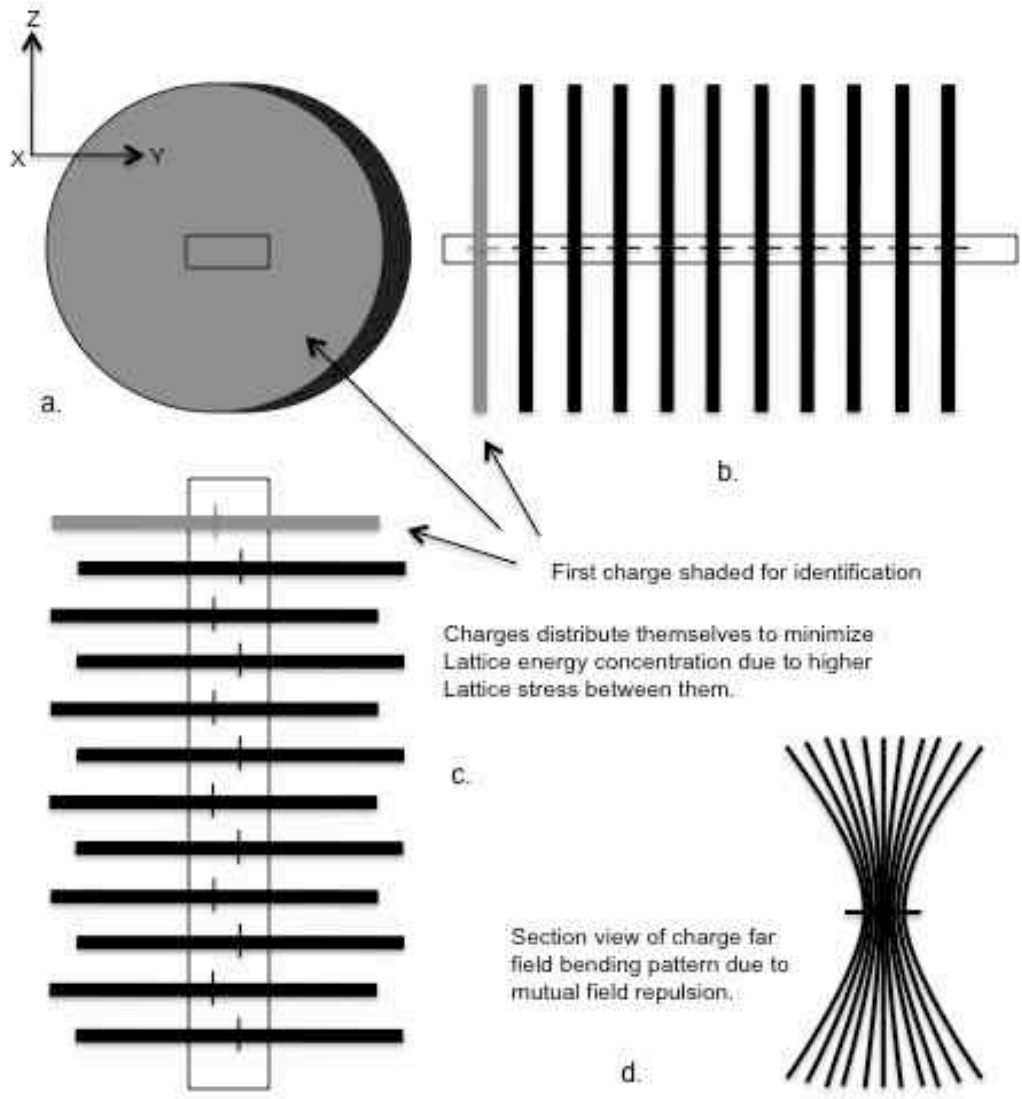


Fig. 20

Electromagnetic charges on a wire –
three Cartesian views

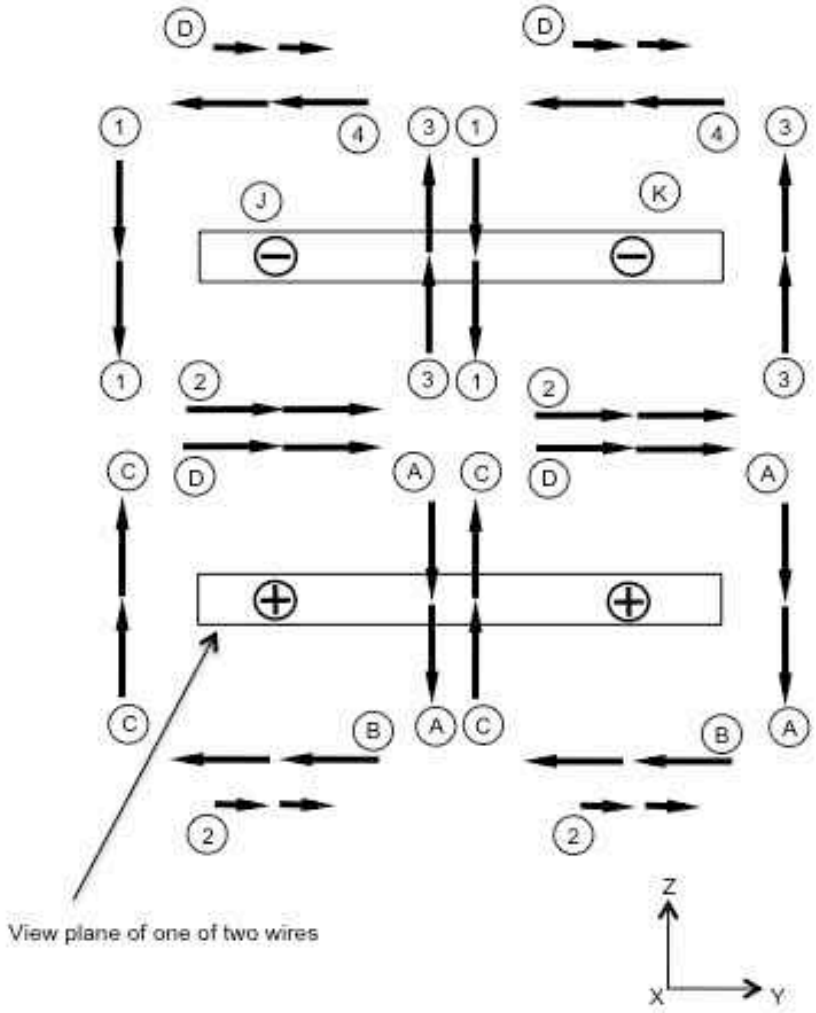


Fig. 21

Electro-magnetic Charge - Capacitive field for 2 wires: addition / cancellation

In Figure 21 above, 4 twist vectors labeled 1-4 in the Y-Z plane equally spaced away from each charge are shown matching those first depicted in Figure 18-a. These vectors depict a CCW Lattice twist around their charge source when facing the charge. Vectors labeled A-D are shown for the corresponding locations surrounding the positive (+) charges. These vectors depict a CW Lattice twist around their charge source facing the charge. Vectors 2 at the bottom and D at the top are duplicates of the lower "2" vector and upper "D" vector with reduced magnitude to show their direction and reduced magnitude at a point in the far field of their source.

SLT suggests that the field of the positive and negative charges will reinforce each other as a strong horizontal field between the wires. Vector 2 adds to vector D . This "sum" field will be fairly uniform across the gap between the plates because as the magnitude of the negative field (vector 2) decreases moving downward away from the negative plate, the magnitude of the positive field (D) increase toward the positive plate.

Within the plates, vectors 1 and 3 at the horizontal center of the plate, from nearby negative charges, cancel; A and C from nearby positive charges cancel. This observation provides additional insight for the SLT charge model. Before the negative charges labeled "J" and "K" were brought together in the wire, their pancake fields spread uniformly with radial symmetry from the X axis of the charge. In the side by side arrangement, each charge now has a very asymmetric field, going to zero twist at the midpoint between them along vectors 1 and 3. Energy was required to "untwist" the fields. That energy becomes the potential energy stored in the capacitor.

Outside the plates, in the far field, all the fields cancel. Vector 1 cancels C, 2 cancels B, 3 cancels A, 4 cancels D. In the near field at the outside edge of the plates, vectors 1, 3, A and C produce "fringing" fields.

To visualize this in 3 dimensions, recall that, for each charge, in the corresponding plane of the charge away from the viewer in the –X direction, the vector rotations for both negative and positive charges, as viewed from the view shown in the figure, is opposite to that shown. So, on the Y-Z plane at –X, the horizontal field will be in the opposite direction.

The parameter known in physics as **capacitance** describes the magnitude of the electrical **potential** (voltage) in a capacitor in proportion to the **number of charges** (integral of current over time) brought into the capacitor. The capacitance is **inversely** proportional to the ratio of voltage to charge. This ratio compares two static properties: stored electrical potential vs. number of charges. SLT suggests that capacitance is an electromagnetic measurement of the Lattice's fundamental **elastic constant** in **twisting**. The parameter known in physics as **capacitive impedance** describes the magnitude of **alternating current** that a capacitor will pass for an applied driving **alternating voltage**. This ratio compares two dynamic properties: applied time-varying voltage, with resulting time-varying current flow. SLT suggests that capacitive impedance is an electromagnetic measurement of the electric LRR in twisting.

Electromagnetic charge – dynamic field, far field shape

Now, consider the electromagnetic charge depicted in Figure 18-c in non-accelerated linear motion through the Lattice along the X axis in the +X direction. For this discussion, also assume that the observer's view is horizontal along the Y axis in the –Y direction. The statement that the electromagnetic charge is in motion, is more precisely stated as the Source Structure Distortion Volume (SSDV) is in motion.

SLT suggests that when a charge's SSDV is in motion, the SSDV "weathervanes" to an orientation such that the charge's X axis always aligns with the direction of motion. Since the charge's LTS is symmetric around X and has second order symmetry around the Y-Z plane, it can move along its X axis in either the +X or –X direction. The pancake surface that faces the direction of motion will be referred to as the "forward" face. The surface that faces away from the direction of motion will be referred to as the "rear" face.

For a specific SSDV to move through the Lattice and remain intact, the Lattice structure related to that SSDV, throughout all of space, has to undergo reorganization as the charge moves through it. This applies to both the gravitational and electromagnetic fields. Considering only the electromagnetic fields here, as the charge moves, Lattice entering the charge through the forward face must **twist**. For a very **slow** moving charge, the Lattice would twist through a motion similar to the static twist function described by the twist magnitude curve of Figure 19. That is, for a negative charge, the

Lattice passing through the charge would initially be twisted in a CCW direction reaching a CCW maximum at the forward face, then twist CW reaching a CW maximum at the rear face, then twist CCW again returning to zero twist as the charge moves away. The far field Lattice must dynamically adjust to all of these twists.

The twisting process, however, takes on a very different geometry as the speed of the charge increases due to the Lattice Relaxation Response (LRR). A moving charge must move its entire field structure through the Lattice, and do so without disrupting any of its long-structure continuity. As the charge moves, the Lattice moving through the charge twists at a rate in proportion to the velocity of the charge in the Lattice. That twist is then transferred to adjacent Lattice components further out like a wave moving in a weighted fabric. But due to the LRR inability to respond any faster than the speed "c", the adjustments appear to proceed outward at an angle from the X axis that is proportional to the charge's speed, using the charge center as the coordinate center. This is depicted in Figure 22 below.

Figure 22-a shows the near field pancake of a charge moving in the +X direction viewed perpendicular to the X axis. The electric pancake field is shown swept back into a cone. While the figure shows a location for the charge center, the charge polarity need not be specified because the cone sweeps rearward, away from the direction of motion, for **both** polarities. Also, while this depiction shows a geometric indication of the near field pancake, on an expanded scale, the cone would have a forward plane twisted one way, a central transition body, a rearward plane twisted the opposite way, and a long trail of recovering Lattice twist. Figure 22-b, a duplication of Figure 18-g, is shown for ease of comparison between the static and moving geometry.

Now consider an electromagnetic charge oscillating forward and backward along the X axis in a periodic sinusoidal motion. The result would be to create expanding circular waves that move radially outward from the X axis like the ripples on a pond from a single stone. The waves will propagate outward from the charge without limit. Energy will be required to accelerate the charge throughout the cycle due to the constant rearrangement being made in the Lattice. SLT suggests that the resistance the Lattice presents to charge motion is the parameter radio transmission experiences which is referred to as the **impedance of space**.

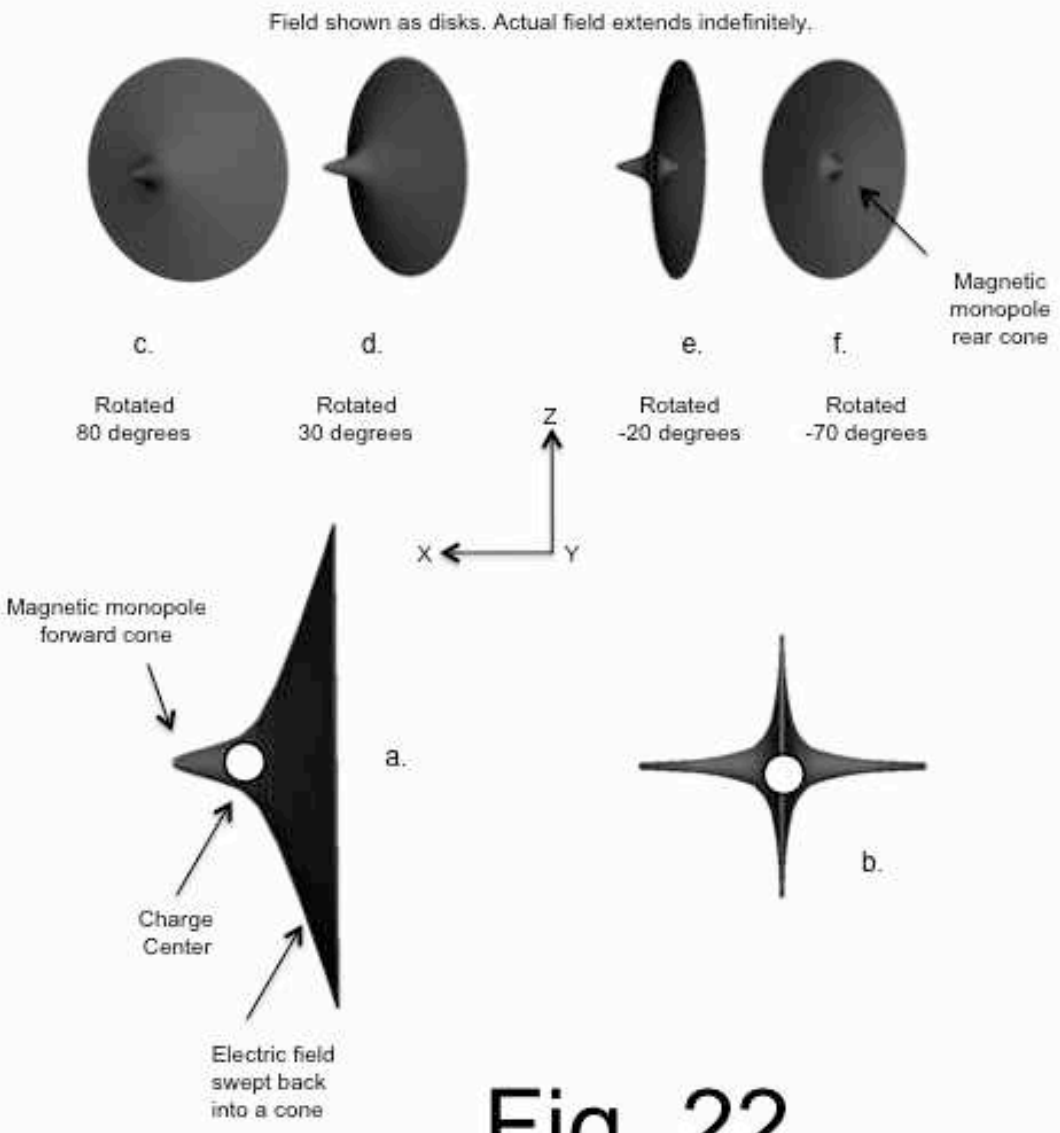


Fig. 22

Electro-magnetic Charge in Motion - Twist Function Perspective Views

The impedance of space occurs in solids, in air and in vacuum because the Lattice pervades all states of matter. The impedance changes in materials because the presence of molecular structure in the Lattice changes the propagation path length for waves in the Lattice.

The shape of electromagnetic waves produced by charge motion can be directly determined from the basic 3-D geometry of the Lattice and the process described in this section for wave production. The SLT moving field model makes a specific claim about the shape of the cone. For a charge moving in continuous uniform motion near the speed "c" (which charges can easily be made to do), the cone angle near the charge will immediately approach a 45 degree theoretical limit. Its far field cone will also approach that angle extending to infinity in proportion to the time from the particle's creation of the near field cone, with the cone's ESD expanding **radially** at the speed "c".

Disturbing large volumes of Lattice requires energy. Therefore, energetic processes are always needed to create an energy pulse to accelerate and sustain the motion of charges.

12.3 Magnetic field

Magnetic field generation by moving electric charges

The concept of a magnetic monopole was presented as an inherent component of electric charges in the discussion of static electric charge. While SLT suggests the existence of such monopoles, SLT also suggests that monopoles are **not** involved with the creation of **significant** magnetic fields nor magnetic effects. SLT suggests that significant magnetic fields are all produced by the **motion** of electromagnetic charges and that significant magnetic fields are entirely due to dynamic modifications of the electric field. Specifically, this implies that electric and magnetic fields are **not** distinct, but rather, variations of the same field structure.

Consider multiple electromagnetic charges moving in linear motion along a straight wire. Each of the charges will carry its own swept-back cone field. This arrangement is depicted for the **near field** pancake structures in Figure 23 below.

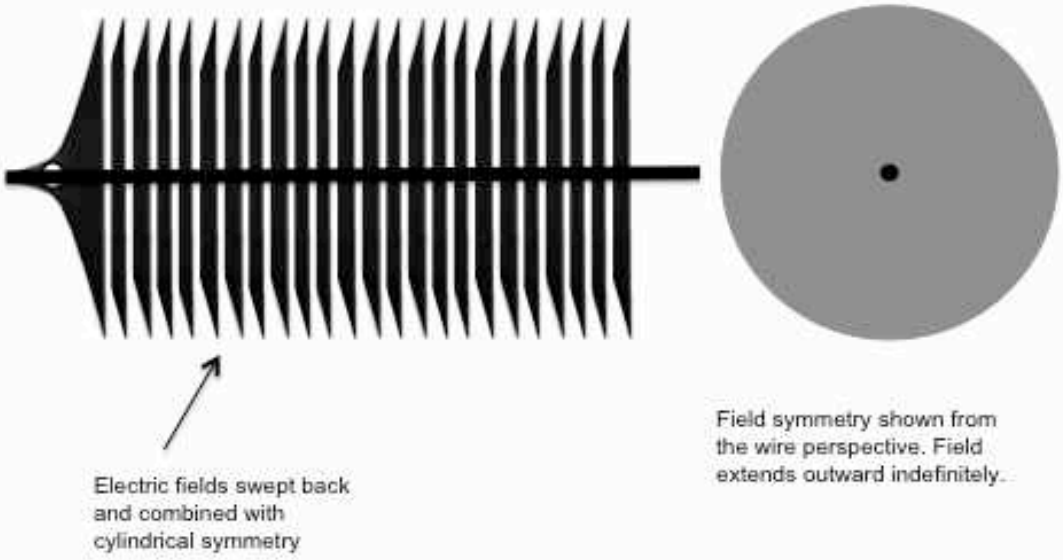


Fig. 23

Electro-magnetic Charges Moving on a Wire - Twist Function Perspective Views

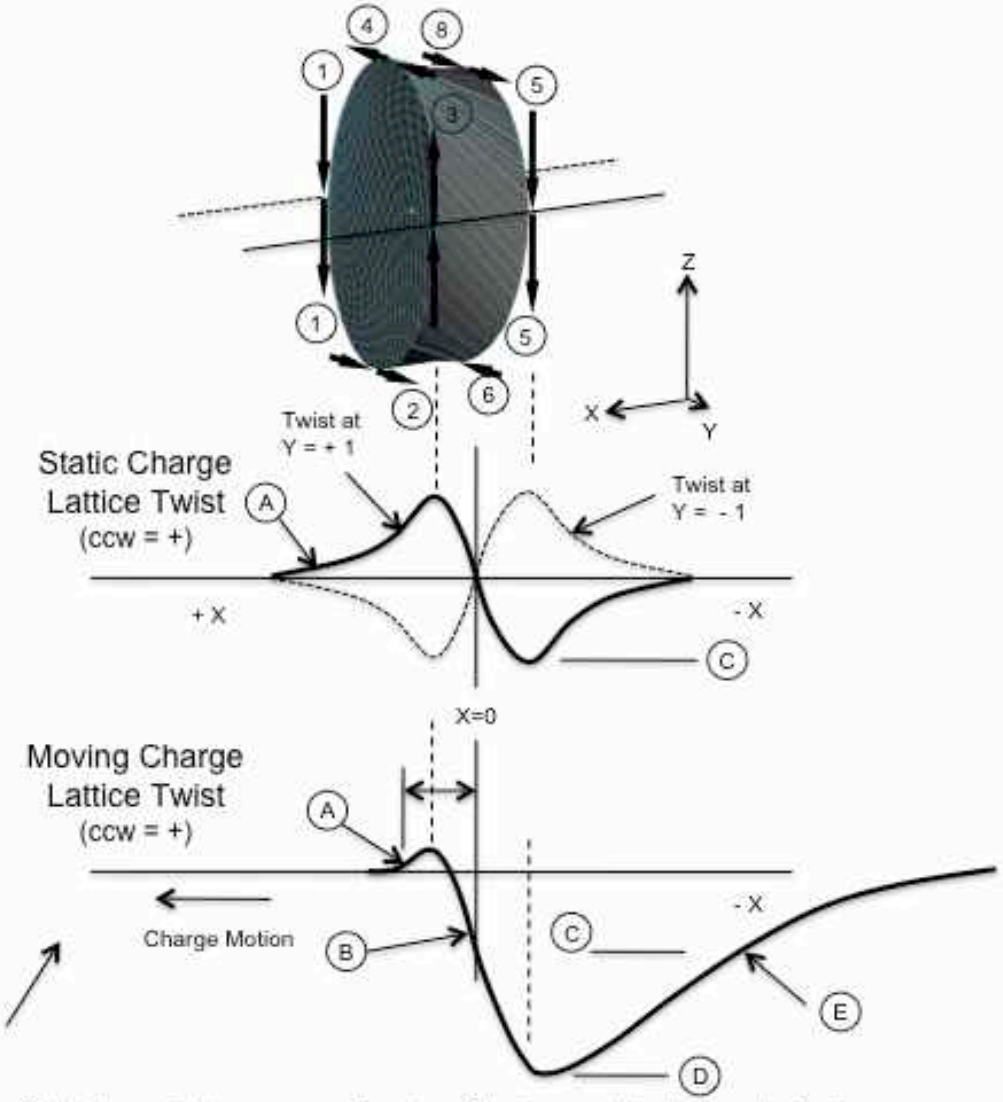
All of the fields would align producing a cylindrical volume around the wire in which the Lattice elements spiral CW in the direction of electron (negative charge) motion. Large volumes of space which surround the wire will exhibit an electromagnetic disturbance which represents the density of the combined fields of the individual charges moving, and their matched swept-back cones. The magnitude of the field will be related to the charge **current** which is a **product** of the number of charges in motion and the speed of the charges.

The electromagnetic disturbance can not be persistent without being sustained by a continuous replenishment of moving charges. Once the charges slow down and stop, all of their conical fields will return to a static, overlapping radial geometry, perpendicular to the aligned charge axis.

The SLT model for **magnetic** fields suggests that they are caused by two simultaneous disturbances in the **electrostatic** fields of involved moving charges: the far field of the moving charges will be bent backward into cones due to the LRR; and an additional dynamic **torsional** twisting is applied to the cones as well. This is discussed in Figure 24 below using the curves labeled "**Static** Charge Lattice Twist", which was discussed in Figure 19, and "**Moving** Charge Lattice Twist".

For a static charge, there is some distance in the +X direction from the center of the charge, at which the Lattice twist achieves a value of, say, 10% (point A) of the maximum static magnitude. The distance at which the 10% level is achieved for a moving charge is shown to be smaller than would occur for a static charge due to the LRR. For a static charge, the Lattice will have had substantial time to reach an equilibrium state. When a charge is propelled through the Lattice by force, however, the inertial properties of the Lattice will resist Aa motion. SLT suggests that the initial maximum +X twist of the Lattice entering a moving charge will be less than the maximum +X magnitude of a static charge due to the inertia of the Aas.

As the motion of the moving charge brings the Lattice into the influence of the charge's SSDV, the charge's structure forces the Lattice to twist at a rate proportional to the **velocity** of the charge and the structural deforming functions of the charge (point B), subject to the rate limit "c".



The twist magnitude curves are aligned as if the view was directly along the Y axis.

Fig. 24

Static Electro-magnetic Charge - Lattice distortion function - skewed

The moving charge response rate, unlike the equilibrium static twist curve, is dominated by Lattice dynamic response. Due to the inertia of the Lattice, the twist going from the +X entry point of the charge to the –X exit point of the charge, will exceed the maximum twist observed for the static case (level C shown in both curves) and reach a **much larger overshoot value** (D) on the moving curve, which could possibly even be reached outside the SSDV. This overshoot phenomena is critical because it will **dominate** the behavior of a moving charge. As the charge passes, the Lattice will **recover** based on the LRR (point E). The recovery, however, would occur after the charge passed, being farther from the rear face of the charge than in the static case. The behavior described by these curves occurs along every line parallel to the X axis with radial symmetry around the axis. The magnitude of Lattice twisting in the Lattice would be **zero** directly on the X axis, increase to some maximum level at some radius from the axis. That radius could be used to define the moving charge's effective SSDV radius, beyond which it would fall off indefinitely.

To provide a visual concept for this twisting and overshoot phenomenon, concepts and nomenclature generally related to aerodynamics will be used.

Figure 25 below presents a functional representation of the dynamic twisting function of an electromagnetic charge using aerodynamic vanes. Figures 25 -a, b, and c show three rotated views of the pancake structure first introduced as Figure 18-c. The Figure 18-c view is reproduced for comparison as Figure 25-d. Its torque vector identifiers are removed and the twisting lines on a radially projected surface are enhanced. In Figure 25- a, b, c, the charge "pancake" is portrayed in semi-transparent form to show a set of 4 aerodynamic vanes inside. These vanes represent a simplified functional model of the twisting function that would produce the 4 twisting vectors shown in Figure 18 . In an actual charge, the twisting structure could be much more complex, and possibly not perfectly symmetric.

The graphic shown as Figure 25-e represents how each vane would "deflect" the Lattice as the charge moved through it. The combined deflection of many vanes spread around the charge, at a finite distance from the X axis, but parallel with the X axis, would twist the Lattice.

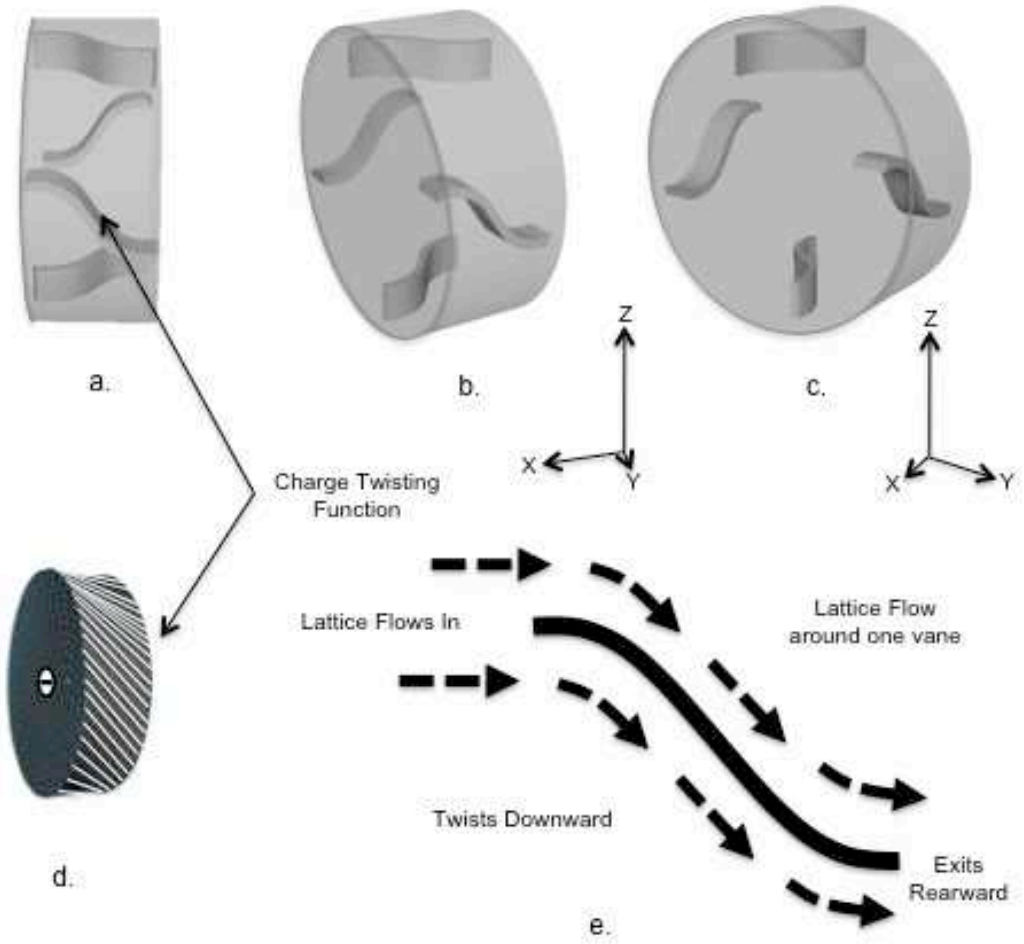


Fig. 25

Electro-magnetic Charge - Dynamic Twist Function Perspective Views

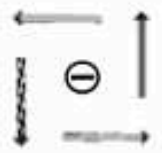
Notice, Figures 25- a, b, c again show the radially symmetric geometry. They show that the charge can function at any orientation angle in the Y-Z plane, and that the charge has second order symmetry around the Y-Z plane allowing the charge to move in either the +X or –X direction. As many charges move together in a line, the twisting effect of each charge begins before the Lattice recovers from the passing of the previous charge. This can introduce substantial twisting into the Lattice.

Static magnitic fields

Figure 26-a below presents 4 twisting vectors for a moving charge that depict the motion dominant twisting function.

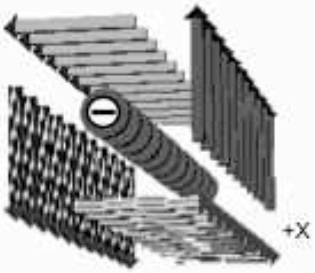
Figure 26-b shows a line of 10 negative charges as if they were moving down a wire away from the viewer toward the +X axis. (While the polarities are somewhat awkward in this view, they are shown this way to be consistent with the polarity and drawings in Figure 18.) Notice that the dominant twist vectors align to form a closed box pattern around the wire. Figure 26-c provides an alternate view. These represent the geometry of the twist in the Lattice produced by the moving charges. While these depictions show the vectors with 3-D rectilinear geometry in keeping with a similar presentation of the Lattice, in actual occurrence, the Lattice strain in the near field would be very irregular following the geometry of the Aas. As the field is viewed farther and farther away, the elasticity of the Lattice and increased number of Aas involved would approach a cylindrical geometry. Figure 26-d shows a conventional portrayal of a current carrying wire and the magnetic field lines that would be expected around it. This geometry is consistent with "**right hand rule**" conventions.

A very important observation for this depiction is that it shows how Lattice distortions can align to create the observations physics refers to as magnetic field lines. Figure 26-d shows how the twisting can appear to form closed loops. This geometry does not occur for the gravitational field, nor does it occur for static charges or magnetic monopoles.



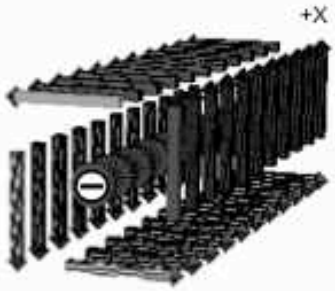
Single SLT charge looking from the –X axis moving away from the viewer toward +X. The vectors show the dominant dynamic twist.

a.



Multiple SLT charges in a line moving away from the viewer toward +X

b.



c.

Conventional wire and flux lines. Electrons moving toward +X, positive current flowing toward –X

d.

Fig. 26

Electro-magnetic Charge - Multiple in-line charges producing magnetic field

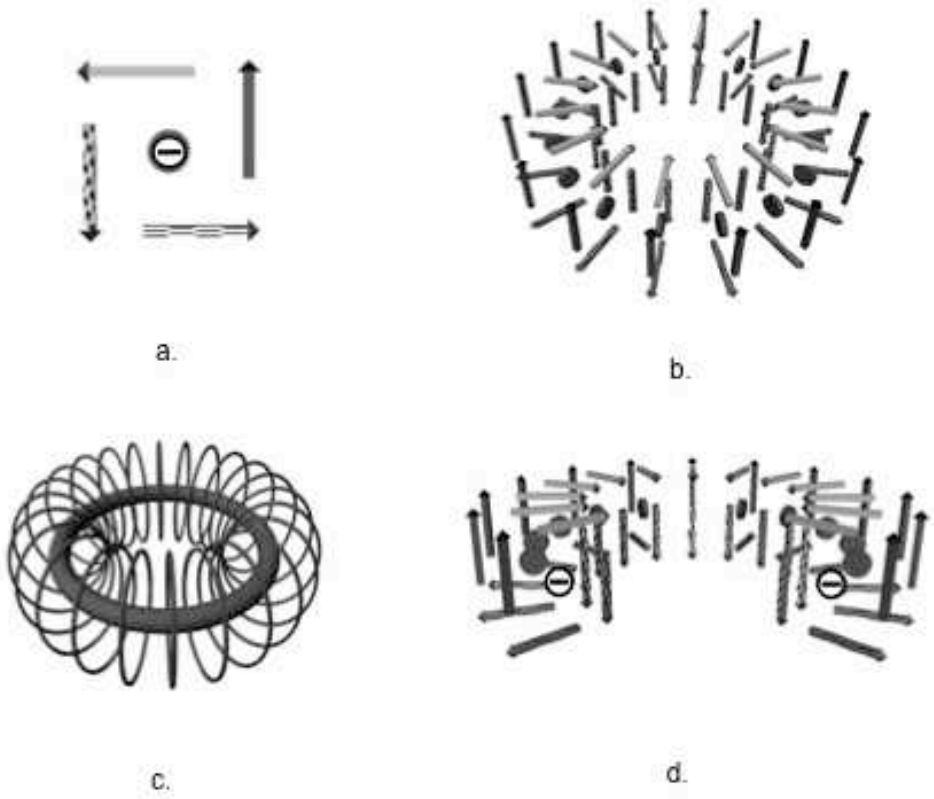


Fig. 27

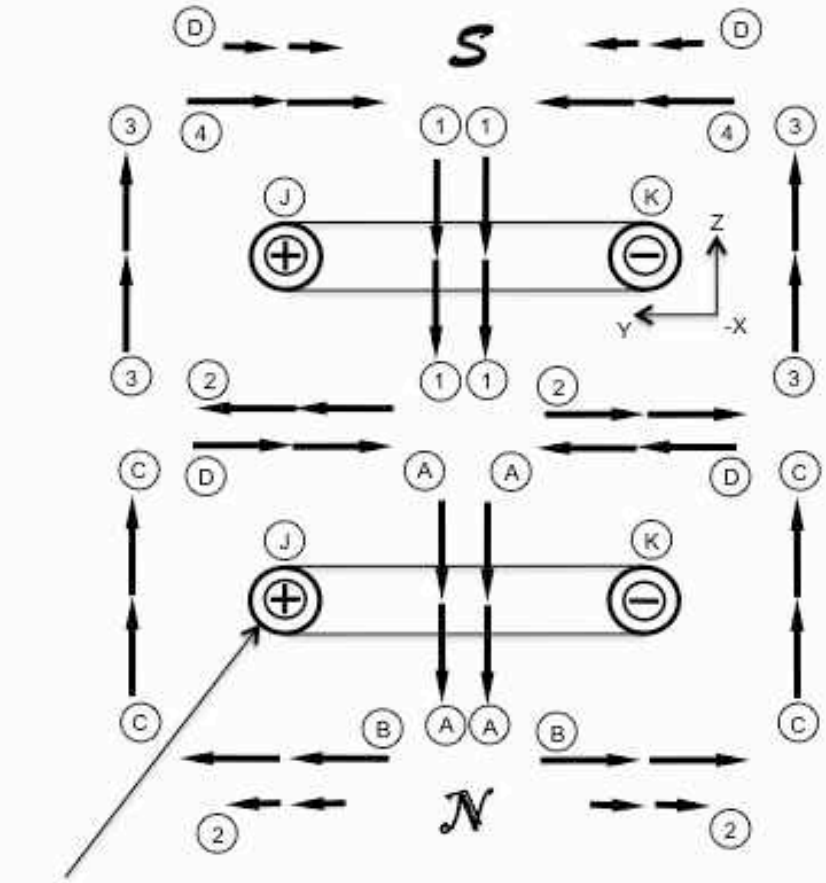
Electro-magnetic Charge - Multiple charges in a closed circle producing magnetic field

The cylindrical magnetic field of moving charges would be referred to as a **static** field in SLT because its geometry is **not** "time varying" or moving in the Lattice. Since the field does not vary with time, **significant** Lattice rearrangement is not required. (This will be discussed in more detail later related to superconductors.) As such, very little energy is required to sustain the field.

Figure 27-a above also presents a moving charge with 4 shaded dynamic twisting vectors. The vector model is then repeated to portray 10 negative charges moving CCW around a closed circle as viewed from above. Figure 27-a shows the vectors with the central source charge. Figure 27-b shows the circular formation. Figure 27-d shows the formation from a lower angle with a slice of the circle removed for better viewing. Figure 27-c shows a portrayal of a conventional circular current carrying wire and the magnetic field lines that would be expected around it, forming a toroid.

Figure 28 below shows two toroids in section view which carry moving electrons in the same circular direction and act as two turns of a solenoid. This graphic is intentionally modeled to be similar to the capacitive field structure model shown in Figure 21. The difference is that, in the case of the solenoid, the charges are moving. But an instantaneous capture of their field structure shows the Lattice and twisting effects are similar.

The arrows marked 1-4 and A-D are vectors that indicate a level and direction of twist that the moving charge's SSDVs have caused in the Lattice. The direction of the arrows marked 4 are opposite on right and left sides of this figure because the motion of the electrons is opposite on the left and right side of the figure. On the left side, at the points marked J, the electrons are coming out of the page toward the viewer (positive current flowing inwards). On the right, at the points marked K, the electrons are flowing into the page away from the observer. For this arrangement, near the center of the toroids, the vertical arrows, 1 and A, reinforce each other while the horizontal arrows, 2 and D, cancel each other out. This is the reverse of the case for the capacitor. Around the periphery, arrows 3 and C create the outer radial field cage. At the top, the large arrows marked 4 are reinforced by the far field arrows marked D from the lower current loop. At the bottom, the large arrows marked B are reinforced by the far field arrows marked 2 from the upper current loop.



Section view of one of two solenoid coil wires

Fig. 28

Electro-magnetic Charge - charge stacking to form a solenoid

A small depiction of a conventional solenoid field structure is shown at the lower right for comparison. The field structure of the main section view would be identical to the conventional structure if the vector drawings were duplicated and rotated at the same angles as shown in the conventional depiction.

The solenoid also produces what SLT and conventional physics would refer to as a static magnetic field because its geometry is not "time varying" or moving through space. But the magnetic field of the solenoid requires a sustained electrical current. If the current stopped, the magnetic field would disappear.

It is important to reinforce the significant distinction between the phenomenon of electromagnetic charges and magnetic dipoles. The electromagnetic charge is an **inherent** property of particular **subatomic** particles. It produces a static field when at "rest" in the Lattice, and a dynamic field when moving in the Lattice. A magnetic dipole, however, is **not** an inherent particle property. Magnetic dipoles are a far field indirect property caused by a **closed path** motion of electromagnetic charges, typically electrons. Single atoms of particular materials like iron, constrain some of their electrons to "orbit" in a single rotational direction in a single plane. It is the orbiting charges which create the magnetic dipole for each atom.

If a magnetic dipole producing atom is at rest in the Lattice, a **static magnetic field** is produced. In SLT, a **static** MAGNETIC FIELD is a twisting distortion of the Lattice. Due to the **rate** of repetitive twisting, and the **damping** of the Lattice Relaxation Response, the field appears to have a "steady state" twist distortion in the far field. Because of the "steady state" nature of the far field, a **very small amount** of **energy** is lost to that field. If the atom moves, however, it's static magnetic field undergoes a source point motion distortion which does require substantial energy.

These three depictions, the wire, toroid, and solenoid, are significant because they show how the SLT model for the electromagnetic charge, once put in motion in the Lattice, produces a closed loop Aa distortion geometry which is consistent with classical observations physics refers to as magnetic field lines.

Superconductors and electromagnetic radiation

In room temperature solenoids with static magnetic fields, the primary energy loss which reduces current flow is due to Ohm's Law thermal resistance heating. This is not observed in superconductor solenoids. A question this raises is, why, in superconductors, don't the moving electrons still produce electric field radiation losses as suggested by the classical Maxwell, Faraday and Gauss laws? SLT offers an explanation for this. The explanation also explains why electrons moving in orbits in atoms (to the extent that orbital model is still valid) would not have radiation losses, and why permanent magnets, toroids and solenoids do not emit "direct current" radiation?

Using the model previously suggested for electromagnetic charges moving through a wire, the cause of radiated energy loss is the requirement that energy is needed to **restructure Lattice** over the extent of the great universe. That is, as a charge moves through the Lattice, the far field distortions of the charge must also be adjusted throughout the Lattice.

Referring to the moving charge graph in Figure 24, a corollary question to the single charge explanation is: what happens to the Lattice when a second charge, or many charges, follow close behind a first charge so that the Lattice has not yet fully recovered. That is, what happens if a following charge is at point "A" in its twisting effect while the preceding charge has left the Lattice at a "D" or "E" condition? Two results are suggested.

First, the preceding charge would leave the Lattice under a higher torsional stress due to its passage. This could reduce the twisting ability of the following charge. If there is a steady stream of charges in motion, eventually, if the Lattice was not disrupted, it would reach a steady-state maximum twist condition. This condition might be accompanied by a small "ripple" variation.

Second, the small scale "ripple" could be significantly damped by the LRR in the far field.

If both of these effects are true, moving charges would **still radiate** energy, but at rates **much lower** than predicted by Maxwell. This model suggests ways for empirical testing discussed later. The proportional effective energy loss would be substantially greater at very low currents, due to higher "ripple". This could improve detection.

Magnetic field – inductance

The parameter known to physics as **magnetic permeance** describes the quantity of magnetic flux that can build in a magnetic field based on the applied electrical force, in terms of **current-turns,** driving field creation. SLT suggests a mechanism and explanation for this phenomena.

As discussed in the prior section, when current flows continuously through a given path in the Lattice, a steady-state Lattice twist would arise. A question then becomes, could the addition of matter in the Lattice affect the amount the Lattice twists at its steady-state point? SLT suggests the answer is yes due to current conventional models for permanent magnets.

It is now believed that the cause of magnetism in permanent magnets is the alignment of atoms in many materials that themselves appear as magnetic dipoles. The alignment is believed to be due to aligned current flow in their electron structures. SLT suggests that these atoms have the ability to cause gross twisting in the Lattice. Whether they are able to easily align, and whether they are able to hold their alignment once organized, is dependent on the molecular structure of their material condition. If a material with alignable magnetic dipoles is placed in a solenoid, then the amount of Lattice twist that occurs at steady state at the center of the solenoid, with respect to the far field Lattice, can be much greater if additional atomic solenoids align in response to an applied current.

The parameter known in physics as **inductance** describes the magnitude of the magnetic flux (Webers) in an inductor in proportion to the electromotive energy (integral of voltage over time) applied to the inductor. The inductance is **inversely** proportional to the ratio of flux to the time integral of voltage. This ratio compares two static properties: stored flux vs. accumulated electromotive drive. SLT suggests that **inductance** is an electromagnetic measurement of the Lattice's fundamental **elastic**

constant in **twisting**. The parameter known in physics as **inductive impedance** describes the magnitude of **alternating current** that an inductor will accept for an applied driving **alternating voltage**. This ratio compares two dynamic properties: applied time-varying voltage, with resulting time-varying current flow. SLT suggests that **inductive impedance** is an electromagnetic measurement of the LRR in twisting.

Given the SLT model, both the capacitive impedance, which is related to a static charge field principle, and inductive impedance, which is related to a magnetic field principle are due to similar measures of the LRR. If this is so, a principle is provided to unify electrostatics and electromagnetics.

12.4 Electromagnetic And Mechanical Energy Forms

Radio waves and pulses

SLT suggests that electromagnetic waves and pulses are explained as simple true waves and pulse **bending** of the Lattice. Specifically, electromagnetic waves are **not** photons. The energy in these vibrations spread geometrically, is subject to $1/r^2$ loss, and can dissipate into the Lattice approaching zero amplitude without a quantization limit. Electromagnetic waves have the traditional properties of waves in a bulk medium. The Lattice is the medium (aether) that has been suggested to exist throughout the ages, although with specific properties created by its discrete structural nature.

The inter relationship of electricity and magnetism, which we call electromagnetism, is described, **generally**, by conventional equations such as those by Maxwell and Gauss. These equations are not changed by SLT as long as they are applied only to "far field" analysis, and their sources are moving slowly in the Lattice. Analyses change radically as the local bending of the Lattice (electromagnetic field) approaches the scale of the Aas, and as the speed of a wave source approaches the speed "c" in the Lattice.

Electromagnetic waves will move in straight lines unless they encounter deformations in the Lattice. They will respond to gravitational distortions, producing the illusion that they possess related mass, because gravity distorts the Lattice framework, introducing wave **refraction**. However, unlike photons, electromagnetic waves can not be reduced in speed in the vacuum of space, nor do they possess rest mass.

While being subject to refractive bending, electromagnetic waves will be more strongly affected by electromagnetic distortions in the Lattice. An example would be the reflection of waves by conductive surfaces.

Electromagnetic polarization is a simple result of the physical geometry of the field creation device (antenna) and electrical drive parameters. For any given source geometry, a sinusoidal wave can be launched with multiple parameters: frequency of the wave, magnitude of the wave, wave shape (due to source motion geometry), time variation of source motion, polarization for linear source motions, etc. These variations can be adjusted by controlling the "antenna" material, and source motion geometry. However, once the "antenna" configuration is established and the time varying patterns determined, the energy transmission will be determined by a single parameter: the electronic drive **voltage.** This is so because the dynamic impedance of the Lattice caused by the LRR will determine the drive current.

Visible light

SLT suggests that visible light is not a single phenomenon. Classical physics has considered light a singular phenomena because of how the human eye and instruments designed to mimic that response perceive it. To understand visible light in SLT terms, it is necessary to consider all the physical elements of the Lattice and ask what dynamics can produce Aa motions that appear as sinusoidal motions with wavelengths between those of infrared and ultraviolet or energy pulses that cause similar excitements in detectors. The discussions of SLT, thus far, have provided four candidate categories: electromagnetic waves, photons, mechanical Lattice bending, and mechanical density (gravitational) vibrations.

Unfortunately, there are no simple **Lattice restricted** properties to discriminate these three effects. The only property suggested so far is the **ultraviolet transition point** that we associate with the lower threshold for photons to carry hole dislocations out of atomic electron shells. This limit is related to SSDV mechanics, not the Lattice itself. Therefore, ultraviolet is **not** necessarily an absolute minimum wavelength limit for electromagnetic waves, nor is it a maximum wavelength limit for photons. Ultraviolet is neither an upper or lower wavelength limit of Lattice mechanical vibrations. Therefore, the wavelength ranges for all four energy candidates could overlap substantially. This is

easily observed with sound wave frequencies, for example, which can extend into the megahertz range while electromagnetic waves can have frequencies well below that of human hearing, at frequencies that would be considered reasonable for gravitational waves.

Thermal radiation

Thermal radiation has always been considered a form of electromagnetic wave. The term "thermal" as in "thermal energy" or "thermal radiation" creates significant confusion, however, as SLT presents new energy concepts, especially in relation to photons. While tempting to redefine this term, the association of the term "thermal", with infrared radiation, is so ubiquitous, that changing it would cause significant confusion. This paper recommends that the term "thermal" should be narrowed to exclude all radiation forms that are capable of transferring matter. This would force it to be analyzed as distinct from photons.

The classical view of thermal radiation is that all atoms, not a rest, emit "electromagnetic radiation" due to their motion because some **charge** or magnetic dipole component of the atom is set in motion.

12.5 Theoretical SLT observation summary for electromagnetics

Theoretical SLT observation summary for electromagnetics - introduction

1. SLT suggests that **all** electromagnetic fields are caused entirely by **structural bending distortions** of the Space Lattice. While electromagnetic fields use the same Lattice components (Aas) as gravity, their Lattice distortion shapes are different and therefore do not interact.

2. **All** electromagnetic forces are due to the interaction of electromagnetic fields.

3. Electric charges and magnetic "sources" are caused by a newly proposed property of matter call a **Lattice Twisting Structure (**LTS**).** This Lattice twisting distortion is distinct from the gravity distortion.

4. SLT suggests that both magnetic dipoles and magnetic monopoles exist.

5. Lattice Twisting Structures occur in two general forms: plus and minus. Each of these occurs in both static and dynamic forms.

6. Electromagnetic distortions in the Lattice can be observed in 5 general forms: 1. "Electromagnetic charge" (static); 2. Magnetic monopoles (static); 3. magnetic dipoles (static), 4. electric waves (dynamic) and 5. magnetic waves (dynamic).

Theoretical SLT observation summary for electromagnetic charge

7. Electromagnetic charge is both an electric charge and a magnetic monopole.

8. The electric field and magnetic monopole field of an electric charge are **inherent** properties of a particle.

9. The electric field of an electric charge is not spherical, but has a pancake shape. The magnetic monopole field has two opposing "funnel-fields" that start in the pancake, spiral radially inward and turn axially outward parallel to the pancake axis.

10. SLT suggests that not all electromagnetic phenomenon have a common foundation, as is assumed in classical physics. True waves appear in the Lattice that are not associated with mass transfer. Photons, on the other hand, are energy pulses that do transport matter through their associated dislocations.

11. The frequency / wavelength range for bending electromagnetic waves, photons, mechanical, and gravitational waves can overlap over a large range.

12. Fields, being a strain distortion of the Aas that pervades the entire universal Lattice, exhibit a **field inertia** based on the inertia of all the Aas in the universe. This inertia is the basis for the impedance space presents to the generation of electromagnetic waves. Energy is required to generate and stop wave motion.

Theoretical SLT observation summary for magnetic field

13. A magnetic dipole field is **not** an inherent component of a particle. The field is produced by electromagnetic charges in motion and is entirely due to dynamic modifications of the electric field .

14. A static magnetic field is a twisting distortion of the Lattice that, due to the rate of repetitive twisting, and the damping of the Lattice Relaxation Response, appears to have a "steady state" twist distortion in the far field.

15. Energy is not lost to a static field because of the "steady state" nature of the far field.

16. The magnetic dipole field of a superconductor appears lossless because: a. it has no Ohmic loss, and b. it's far field is static. However, upon further examination, it will be found to have "ripple" losses.

17. SLT suggests that **inductance** is an electromagnetic measurement of the Lattice's fundamental elastic constant in twisting.

18. SLT suggests that **inductive impedance** is an electromagnetic measurement of the Lattice Relaxation Response in twisting.

Theoretical SLT observation summary for electromagnetic energy forms

19. SLT suggests that electromagnetic waves and pulses are explained as simple true bending waves in the Lattice.

20. SLT suggests that visible light is not a single phenomena, but rather a combination of electromagnetic waves, photons, mechanical Lattice bending, and mechanical Lattice density (gravity) vibrations.

21. SLT suggests that the term "thermal radiation" not be limited to wavelengths of infrared light. A new term, "Lattice vibration" would apply to the full range of energy in the form of Lattice vibration.

13 Nuclear Physics

13.1 Structure of the atom

Atom basics

In SLT, atoms are collections of the classic fundamental particles: protons, neutrons and electrons. Atomic properties, such as the number of particles, the atomic structural forces and electron dynamics, are considered **far field** effects in SLT and are not changed by SLT. Most conventional concepts of atoms at the chemical level are not effected by SLT.

The Bohr model

The model that classical physics initially used for atomic structure is the one proposed by Niels Bohr in 1913. The Bohr atom was envisioned as analogous to a solar system. A heavy positively charged nucleus performs the role of a massive "sun" and much lighter negatively charged electrons orbit around the sun in the role of "planets", held to circular paths by the attraction between their opposite electrical charges. The model, while appealing, raised challenges that science has still not been able to resolve. Some of these are {Helmenstine}:

1. Electrons are not able to orbit at arbitrary distances from the nucleus as planets are from their suns. Electrons can only orbit with quantized values. This challenges the assumption that electron motion is orbital, and caused by a force attraction between its charge and the nuclear charge, as planet orbits are caused by gravitational attraction.

2. The energy changes are assumed to be related to the capture or emission of photons.

3. According to Maxwell's equations, any charged particle in motion radiates energy. If electrons are moving in orbits, they should continuously radiate energy, which they don't. However, it is also observed that orbiting electrons do radiate and absorb energy. But these energy changes are assumed to affect the orbital potential energy, changing the orbital velocity and distance.

4. The model does not explain the Zeeman Effect.
5. The model does not explain bond angles for chemical combinations.
6. The model does not accurately predict values for the spectra of many atoms, nor the relative intensities of spectral lines; nor the hyperfine structure of spectral lines.

The structure proposed by SLT for electromagnetic charges can provide new alternative concepts to address the challenges listed for the Bohr model.

1 and 2. SLT suggests that photons transfer mass. If an electron captures a photon, it effectively increases its mass as well as bringing the electron an energy boost. The significance of this photon capture process is that: a. the mass increase would be quantized because the photon has only a single dislocation; and b. the mass increase becomes an integral part of the capturing electron. This is independent of how the orbital energy varies as the charge navigates its dome and interacts with other charges. That same mass will be shed if the electron shifts energy levels downward again through photon emission. The measurement of free electrons may not always be at the ground state mass.

The SLT description of static electromagnetic fields provides a functional explanation that shows how charges can be in motion and not produce Maxwell radiation.

The Zeeman Effect occurs when atoms are stimulated into emission in the presence of a magnetic field. When this occurs, the normal emitted photon spectral lines are observed to split into multiple lines. While the Bohr model does not explain Zeeman lines, due to it's simplicity, the addition of properties like "spin" to the orbiting electrons do provide an explanation. SLT's suggested structure for the electric charge provides additional complexity that might help explain particle "spin", possibly suggesting more accurate visualizable terms for the property.

5 and 6. SLT is consistent with the cloud model on these points.

Cloud Model

In 1926, Erwin Schrodinger proposed the atomic cloud model. The cloud model starts with the same sun–nucleus / planet-electron fundamental that Bohr used, but doesn't require the electrons to have circular orbits. Cloud orbits can be highly elliptical. This is **not** a **functional** model that explains the mechanics of individual electrons in motion. It is a mathematical probabilistic model that describes the geometry in which electrons might be statistically found around a nucleus. The model describes the probable location of electrons in the form of density gradient "clouds" surrounding a nucleus. This is an effective pragmatic approach because modeling the interactions for multi-body structures in 3-D is still beyond the capability of current technology. The geometry is only a sphere for hydrogen. For atoms with more than one electron, the geometry takes on the form of lobes. While this model is now the predominant model, it also fails to address all of the challenges listed above for the Bohr model except numbers 5 and 6, which it enables, but still doesn't explain.

SLT does not directly lead to any specific atom model. However, SLT does suggest some new concepts for the electron and nuclear force structures, which may provide alternative ideas to structure the atom.

The pancake structure of the electric field, and the pancake magnetic field formed when the electric field moves in the Lattice, add limitations on the degrees of freedom allowed for electron motion in atoms. The limitations may help explain the quantization of orbits and the lobed structure of the cloud model.

The SSDV concept could support an atom with some form of "structured" electron "shell" even if the shell undergoes continuous change. The Lattice might provide additional structure so that electrons would not be required to "orbit" a nucleus to create a stable atom. The term "shell" might morph into an irregularly shaped "geodesic dome". The dome might sit at some stable distance away from the nucleus, anchored by dislocation arrangements that enforce a spacing between the dome and the nucleus. This distance would be determined by other electrons associated with the same nucleus. As domes filled up, additional dome layers could build on the lower ones.

13.2 The atomic nucleus

Particle accelerators and elementary particles

The current theory that neutrons, and protons are composed of subatomic particles, and that there are 61 such "**elementary particles"**, is known as the STANDARD MODEL of Physics (SM) {38}. SLT does not dispute the organization of the observational data nor the existence of the observations behind the SM. However, SLT does suggest a very different explanation for the nature of the SM structure. SLT also suggests that it is misleading to categorize the components of the theory "sub-particles" of the **naturally occurring stable** neutrons, protons and electrons. A better characterization would be the term "fragmentation artifacts".

All of the experimental results behind the Standard Model are produced by using high energy particles to break other particles apart. Various detection methods are then used to observe the products of these destruction events. SLT suggests that neutrons, protons and electrons are each composed of specific, repeatable arrangements of dislocations. It is reasonable to expect that if a large number of a particular particle type, for example protons, were broken apart, then **fragments** which represent **portions** of the proton, in numerous forms, would be **temporarily released**. Quarks are an obvious example. While possible SLT structures for protons and neutrons are not inconsistent with quarks being "**sub-structures**" of those particles, SLT does not consider quarks themselves to be **particles** because they do not exist in a stable form.

The fragments of proton collisions could then, possibly, recombine into new protons. However, they could also recombine into **other temporary objects** that would **not** be found as geometric forms in a stable proton. Evidently, some of the temporary objects that are observed are many times larger and heavier than their source protons and neutrons. This clearly begs the categorization of these objects as "components" of their sources. Ironically, "The familiar proton and the neutron are the two baryons having the smallest mass." {38}

Labeling these newly **produced** objects "sub-particles" or "elementary particles" is misleading because they **lack** the properties of **stability** and **mass** that are significant attributes of the "particle" category. It is essentially like calling bricks, glue, electrical

wire and paint color "sub-**buildings**". A **room** might merit carrying the "building" qualifier, but not glue and color. The term "sub-component", however, would be appropriate as long as the component retained its identity within the larger component. Temporary wall bracing or paint solvents, for example, which "mediate" the assembly of the building, but that disappear or are removed after use, would not appropriately be called sub-components.

It is reasonable to expect that, as higher and higher energies are used to break apart neutrons and protons, the 61 item count in the SM will continue to increase. But these newly identified items will not likely be found as sub-components of the fundamental particles: "Second and third generation charged particles… decay with very short half lives, and are observed only in **very high-energy environments.**" {38}

While SLT does not support the "sub-particle" categorization of the SM findings, applying the SSDV model to experiments with particle accelerators could offer new outlooks for interpreting the observations as stronger test energies are applied. This new outlook could lead to valuing the discoveries as new particle types in their own right. This is particularly the case if the SLT concepts related to black holes and the big bang are applied.

When particles are brought together with very high energies, the structure of the Lattice and organization of the Aas may be locally torn apart resulting in the creation of "un-captured" local **voids** that are naturally only characteristic of black holes and the big bang. As the Lattice pressure pushes the disrupted Lattice back together, many temporary structures may form including those hypothesized for the conventional big bang model.

The Strong Force

One of the functions needed in the Standard Model (SM) is referred to as the "Strong Force". This is the force that binds protons to similarly charged protons as well as to neutrons. SLT suggests a possible simple explanation for this in Figure 29 below.

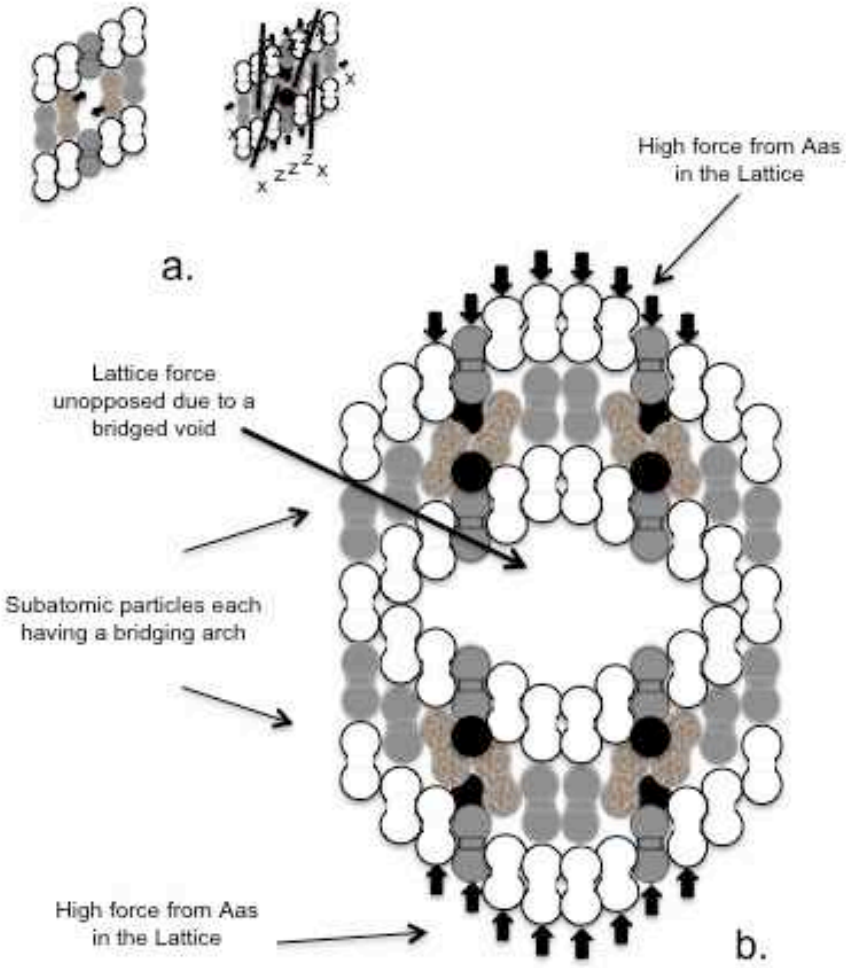


Fig. 29

Strong Force – particle bridging structure

Figure 29-a shows part of the Lattice section from Figure 7-a that was used to explain how the Lattice could respond to a dislocation. Assume that the dislocations in protons and neutrons are arranged during creation, or altered during atom creation, to form **bridging arches** on their surface. Figure 29-b shows arch sections of two such particles that align to form a clam shell with a void between them. These mating sections would constitute only a very small portion of the particle surface. The unbalanced force that the Lattice could apply to the exterior of the bridge sections holding them together could be **very large** compared to the bending forces produced by gravity or electrical twisting. The importance of the envisioned form of this geometry is that the "strong force" is created by the same Lattice components that have been described to created all the other forces in the Lattice.

Bosons

SLT suggests that the gluon, Higgs boson, Z and W bosons (particles g, H, Z and W) are artifacts of accelerator experiments. The entire function of force creation in SLT is provided by the prevailing Lattice pressure.

Photons

Photons have been discussed in detail in previous sections. SLT does not consider photons massless. A key discriminating property of the photon in SLT is its ability to transfer mass. What has not been discussed yet is the ability of photons to exist at very low energy and in fact come to rest. This will be discussed below in the sections for Red Shift and the Microwave background.

Standard model anti particles

The Standard Model states that each fermion has a corresponding "antiparticle". SLT suggests the prefix "anti" is misleading because all it refers to in the Standard Model is the inversion of some specific parameter of the particle, which is usually an opposite electrical charge. All of the parameters are not required to switch simultaneously. For SLT, charge and mass are independent properties. SLT suggests that constructions of matter can exhibit complements for charge, magnetism and gravity, as previously discussed, and it would be better to term them narrowly; i.e. "anti-charge" "anti-spin" particles etc.

13.3 Quantum Mechanics

In his Scientific American article {Smolin 2004}, Smolin states,

> "The equations of quantum mechanics require that certain quantities, such as the energy of an atom, can come only in specific, discrete units. Quantum theory successfully predicts the properties and behavior of atoms and the elementary particles and forces that compose them. No theory in the history of science has been more successful than quantum theory."

While **Quantum Mechanics** (QM) has been valuable for predicting measured observations in physics and chemistry, the term "quantum mechanics" is frequently misused and misunderstood in science because it is applied to multiple unrelated phenomenon which include at least the following variations:

1. The initial discovery that launched QM was the **quantization** of discrete wavelengths of light emitted by atoms. This property is related to the allowed electron states and state transitions of atoms, which quantify the photoelectric effect.

2. QM was then used as a label to capture the discussion of the **particle-wave duality** model for photons, which is not related to the photoelectric interaction of photons.

3. QM was then associated with the Heisenberg Uncertainty Principle, which claims a limit, not a physical structure, which is placed on the accuracy with which observations of position and momentum can be made simultaneously on particle momentum. This principle, **however**, is dependent on the assumption that particles are "**wave**" systems, or that measurements are made using "**wave**" based tools, i.e. light. The uncertainty principle therefore describes a limitation of the **analytical** mathematics, not a fundamental limit of physics. SLT does not accept these assumptions.

4. QM was then associated with the second law of **thermodynamics**, which describes the effect of molecular motions in gases and liquids used in heat engines.

5. QM, using second law "concepts", was claimed to describe the necessary "**loss of information**" in data communication and storage applications.

6. QM was again reapplied from communications to particles crossing the event horizon of a black hole.

7. Recently, QM has added "Quantum Entanglement" under the same banner.

Referring back to Smolin's statement, it appears that **claiming** the **superior success** of "quantum mechanics" is misleading because it is summing the individual successes of multiple analysis methods for unrelated physical principles, rather than for a single phenomena.

SLT suggests that multiple forms of "**discrete**" phenomenon exist in physics. SLT does use the term "**quantum**". However, unlike mathematical models, which simply structure observation which appear in patterns, SLT presents specific visualizable explanations for the underlying phenomena which create the discrete behaviors. When using the term "quantum", SLT specifically means "a property of some phenomenon that only allows that property to exist in **discrete units**. The smallest theoretical unit of such a property is referred to as a **quantum**.

To be clear, SLT does not imply that the presented visualizations apply to any phenomenon at scales other than those specifically described, or to geometries other than those specifically described.

The arrangement of Aas for each fundamental particle is unique or encompasses some finite number of arrangements. Thus, the particles can be described as **discrete**. Thus SLT accepts a quantum view of fundamental particle construction where "quantum" in this usage means a discrete geometric arrangement of finite **mechanical** units. This is similar to the SM view that neutrons and protons are composed of quarks, for example,

and opposed to models that suggest these particles have a homogenous internal structure. The structure of the Aa, however, may be internally continuous.

The combinations of fundamental particles to form higher, more complex particles are also a discrete set due to the geometric restrictions on the discrete ways Aas can connect. The **discrete** structure of fundamental particles is related to the discrete nature of the Lattice Aa elements.

The smallest discrete (quantum) of mass is the result of the simplest dislocation unit. This creates the smallest magnitude (quantum) of gravity. More complex masses are composed of discrete numbers of dislocations, creating a categorizing basis for a table of particles. However, even though the dislocation count is discrete, the differences in the gravitational magnitudes may not follow a simple additive rule because the dislocations can assemble in complex geometries. So the smallest "delta" in mass may be much smaller than the single dislocation mass.

A smallest quantum of "energy conversion" can be found for the conversion of the smallest amount of mass to energy. However, energy may exist in the Lattice as a continuum, without any quantization, due to vibrational dispersion loss in the Lattice.

13.4 Theoretical SLT observation summary for Nuclear Physics

Theoretical SLT observation summary to restudy the atom

1. In SLT, atoms are collections of fundamental particles: protons, neutrons and electrons.

2. The structure proposed by SLT for electromagnetic charges can provide new alternative concepts to address the challenges listed for the Bohr model.

3. For the Cloud Model, the pancake structure of the electric field, and the pancake magnetic field formed when the electric field moves in the Lattice, add limitations on the degrees of freedom allowed for electron motion in atoms. The limitations may help explain the quantization of orbits and the lobed structure of the cloud model.

4. Due to the addition of the Lattice, in SLT, electrons are not necessarily required to "orbit" around a nucleus. The electrons may form "structured domes" that continually reorganize.

Theoretical SLT observation summary for the atomic nucleus

5. SLT does not agree that the fragments of particles observed in accelerator experiments are elementary **sub-components** of neutrons, protons and electrons. Rather, SLT suggests that these observations are unstable conglomerations of fragments of the stable particles and not basic building blocks.

6. SLT suggests that the strong force is caused by the inherent Lattice pressure acting on "bridging arch" structures that are part of the nuclear particles.

7. SLT suggests that many unstable forms produced in accelerator experiments are newly created objects produced by random organizations of Aas during reassembly of exploded Lattice structure rather than being discoveries of additional fundamental particles.

8. In high energy collisions, the Lattice can be torn apart, creating micro voids. Aas can drift into the voids in any orientation.

9. As the Lattice reforms under the universal pressure, many Aas will self-assemble as pure Lattice. But new particles may form as well. The particles that form may have structures that are marginally stable.

10. As the Lattice squeezes back together, newly formed particles can be ejected from the closing void. The length of time they persist depends on their structure and the field and dislocation environment they pass through.

11. Other marginally stable particles can be trapped in to closing void volume. These can be destroyed as the closing void pressure increases.

12. Those particles that survive the previous situations are then susceptible to being broken apart by other Lattice processes.

Theoretical SLT observation summary for quantum mechanics

13. While SLT is founded on discrete elements to build the Lattice structure, the ability of those elements to form complex architectures does not allow an easy association of quantized units for mass and energy.

14 Problems with Existing Theories

14.1 The Speed of Light Problem

Early Concepts

The scientific study of light is very far from a modern endeavor. Experiments and relatively astute concepts were already well documented in the "literature" by 380 BC! In fact, giving credit where it's due, the ancient Greeks already had the basic principles pretty well outlined. By 380 BC, there were three schools of philosophy exploring the same 3 fundamental concepts about the nature of light that current science still hasn't resolved. The Greeks already understood light as part of a communication system. That is, in any communication system, it is typical to categorize three transmission functions: a source, a transmission medium, and a receiver.

Pythagoras, about 530BC, taught that the eyes of animals were the key to light. The eyes reached out with miniature invisible hands on long, thin, invisible arms. These hands went out in the direction that the eye was aimed, being bounded in the form of narrow cones. The hands felt objects that they ran into like a blind person would feel an object. The tactile feelings of these hands gave animals the perception of vision.

Democritus, in 460BC, taught that the key to light was its source. Democritus believed that everything in nature was composed of tiny particles he called atoms. The atoms of an object acted like a source, shedding skins of themselves that flew through the air. When the skin hit an animal, it shriveled up and went into the animals eyes, causing the animal to have a perception of the object that shed the skin.

Aristotle, about 380BC, taught that all surfaces had vibrations. But they did not shed skins. Instead, the vibrations caused waves in the "aether" which traveled out in all directions like ripples in water. When the vibrations hit an animal's eyes, the perception of the object that caused the vibrations was formed.

After 2395 years, science is still debating whether the speed of light, and therefore what controls the speed, is dependent on the source, the medium, or the receiver (observer). Science is still debating the fundamental principles of light: whether it is a particle,

ballistically launched by a source, a wave, propagating in an aether, or some unspecified set of **magic hands** that reach out from the eyes of an observer, or the atoms of a sensing instrument, and sense the source.

While this last phrase about "magic hands" clearly begs the defense of poetic license, some sort of outreach from an "**observer**" is needed to provide a mechanism for an observer based model, such as Einstein's Special Theory. In order for the speed of light to "appear" unique to each individual who observes it, we actually need the equivalent of our own "magic arms" reaching out. That is the only way every individual observer can simultaneously have their own unique experience. That brings us back to Einstein's philosophical dilemma: associating the speed of light with an observer didn't make logical sense.

Around the time preceding Einstein's paper, scientists were proposing that the speed of light is **constant** at about 186,000 miles per second with respect to **every individual observer** at the same time. If a light beam is approaching observer A from a star that's a billion light years away, how would that light beam have known how fast to travel through all of space so that it hits observer A with an accumulated billion year history of traveling at precisely 186,000 miles per second with respect to that observer regardless of the state of motion of that observer at the time the beam reaches them? The range of travel speeds has to be very broad. The observer could be standing on a planet circling a star anywhere in the universe. The star could be moving at radically different speeds depending on its orbital location in a galaxy, which itself could be moving at great speed.

This is a profound philosophical challenge given that observer A didn't even exist for most of those billion years. Furthermore, how would the light beam even "**know"** what direction to head off in to find that observer? To be sure of reaching observer A, the source would have to launch precisely controlled light beams, of exactly the right speed for observer A, in every possible direction. What then is done for millions of other observers, each of whom has a different motion history?

The "obvious" philosophical answer for this example, is that the assumed model behind matching light speed to observers is wrong. Light beams can't have prior knowledge of

observers. They must launch and travel based on parameters only relevant to their current environment. The problem with this answer is that it does not reflect how the physics of light is explained by Special Relativity. To be more precise, Special Relativity does not regard light as having a reality independent of an observer! This will be discussed further in a following section about Special Relativity. But it is a serious challenge.

Michelson-Morley

The primary concept in vogue for the structure of light in the early 1800's, and prior to Special Relativity, was a wave. And just as water waves are an organized motion of water moving as a wave through water, and sound waves are an organized motion of air molecules moving through air, it was believed that light waves had to be an organized motion of parts of some medium moving through that medium. The passage of light through air or water or glass could be rationalized as motions of those substances, because a substantial affect on transition speed could be repeatably observed in them. The big challenges were starlight moving through the vacuum of space, and the ability of light to speed up again after slowing down to move through a material. The material of space that light was thought to move through was referred to as the "aether", which ironically, is just the ancient Greek word for space.

In 1881, Albert Michelson designed and built an instrument to sense the aether {Michelson 1887}. He designed the experiment **specifically** to measure the **speed of the earth through the aether**, thereby confirming that it was actually there. He formulated a hypothesis that his instrument would measure an earth motion speed equal to the telescope based calculated orbital velocity of the earth around the sun: 107,800 km per hour. To test his hypothesis, multiple **assumptions** were made by Michelson or can be deduced as needed for his experiment:

1. If there was an aether, it would not be captured and dragged along by the earth. If that were so, there would be no relative motion.

2. The earth could also not be the center of the universe, as many religions claimed. If so, and aether motion was anchored to the center of the universe, i.e. the earth, no aether motion would be detected.

3. Michelson did make an assumption that most people don't know about. He assumed that the aether was anchored to the sun and rotationally stationery with respect to the distant stars. He gave no explanation for assuming that the sun could capture the aether but that the earth would not.

4. The goal of the experiment was to measure a speed for the earth in its orbit through the sun-stationary aether, which was known to be about 107,800 km per hour.

He built an instrument and ran a test in 1881. The result he expected to get to confirm his hypothesis was a 0.04 shift of a light wave. He got **various results**. He recorded measured shifts as high as 0.018. Even averaging values, he got a result of 0.008. Not confirming his expected reading of 0.04, he reported: **NULL result**. Most people, including most scientists, still assume that **NULL** meant ZERO! But that's not what Michelson measured. The 0.018 value is just under 50% of what he expected. And since the observation includes a square law relationship with aether speed, that measurement would indicate that there **was** an aether and at the time of the 0.018 measurement, it was blowing 70% of the speed he expected or about 75,600 km per hour.

The press, however, did not ask for details, nor did they encourage reviews of the experiment by others. They announced that there was a **null** result! The concept of the aether was **dead**! Since then, the news media has continued to look for simple answers to continue to support the no-aether assumption. The scientific community has also polarized into yes and no communities more intent on winning their view than understanding what is really going on.

In 1887, Michelson, with Morley, built an improved instrument {Michelson 1887}. The new measurement was 0.025 against an expected shift of 0.4 waves. That was only 6.4% of the expected amount. The velocity of the aether being related to the square root of this number gives an aether velocity of 16% of the expected amount or about 17,700 km per hour. The aether was again proved **dead** according to the media, even though 17,700 km per hour isn't zero. Others, however, were skeptical of this "null" pronouncement.

Michelson gave up his interest in the subject. Morley continued, teaming with Dayton Miller {DeMeo 2002}. In 1904, still before Einstein's paper, using a further improved

instrument, they got a 12,900 km/hr result. And while better instruments appeared to be **trending** toward zero, 12,900 km/hr still isn't zero. Miller believed they were all being fooled. He didn't accept that the aether could be captured by the sun, which was an assumption that Michelson made, but wasn't also at least partially captured by the earth. He believed they were getting small results because the mass of the earth **was** somehow trapping the aether around it. More tests were done, each time with better instruments. The other factor he changed was test location, moving the tests to the tops of mountains, thinking that the earth-drag effect might be less there.

In 1921, Miller measured 29,700 km/hr aether speed. Other experiments, using similar methods are: Tomascheck, 1924, 28,000 km/hr; Miller, 1926, 30,200 km/hr; Kennedy, 1926, 18,300 km/hr; Piccard, 1927, 22,600 km/hr; and then Michelson, again reentering the picture, 1929, 11,900 km/hr.

Even with continually improving instruments, the numbers did not go to zero. Yet both the public and the scientific community at large still believe and report that the measurements of aether drift have **demonstrated zero** speed. Cahill summarizes this tragedy:

> "Over four fateful days in July 1887 Michelson and Morley ever so carefully rotated the device, a mere 36 times only, and their observations were to lock physics into more than a hundred years of nonsense about the nature of time and space. They did detect the fringe shifts, and their paper has a table of the values. But all physics books incorrectly claim they saw nothing, that it was a **null** experiment."{Cahill 2005}

SLT suggests that Dayton Miller was correct. The mass of the earth is able to retard the movement of Lattice through it. Any large collection of mass, or more specifically, any intense **gravity field** would be able to do so. Therefore, if there is a general universal Lattice flow, the Milky Way galaxy would entrap Lattice as the summation of the Lattice retardations for each of its components. The sun would do an entrapment, as assumed by Michelson. The earth would make a further entrapment, the accumulated entrapment being strongest at the earth's surface where the gravitational field is the strongest, decreasing outward into space.

Criticisms of basic physics

There have also been numerous criticisms of the physics models used for many of the experiment's components. For example, Marmet explains the Huygen's requirements that the velocity of the mirrors be accounted for as well as the deviation of the apparent entrance angle of light to the mirrors due to motion aberration. {Marmet 2004}

In short, while the interferometer method of aether testing appears simple, there are still challenges to a number of basic physics assumptions and how models are applied that have not been answered. There are surely challenges to the mechanism society has established behind the protocol for doing academic science.

Single direction experiments

An article by Reginald Cahill {Cahill 2006} describes an experiment conducted in 1991 by Roland De Witte at the Belgacom telecom company in Brussels. This "accidental" experiment occurred in an attempt to synchronize 2 timing clusters, each having 3 atomic clocks, which were separated north - south by two parallel 1.5 km coaxial cables. A 5 Mhz RF "synchronizing" wave was sourced at each cluster and sent one-way to the other. Time mark recordings were made over 178 days. The data from this experiment shows that De Witte had detected absolute motion of the earth through space at a rate of 500 km/s along a north-south path parallel to the earth's surface at 51 degrees north latitude. The data varied daily due to earth rotation, tracking sidereal time (star based vs. solar time. The data, which was taken frequently, also suggested that the aether flow was not constant but exhibited fluctuations over the test period as large as +/- 110 km/s with variations between maxima and minima as short as 3 hours. Cahill equated the flow fluctuations to gravity waves.

De Witte was not able to get scientific journal support to publish his data. Cahill obtained the data from a website that no longer exists.

Observation summary for the speed of light problem

1. The source / medium / receiver controversy about the fundamental nature of light transmission has existed as an established scientific challenge for 24 centuries.

2. The latest attempts to resolve the physics of light transmission have been rife with error. There is substantial support for the existence of an aether that transmits light. SLT suggests that the aether is the Lattice.

3. The Michelson-Morley experimental design and results have been misrepresented by both the media and the scientific establishment. The result has been "to lock physics into more than a hundred years of nonsense about the nature of time and space."{Cahill 2005}

4. SLT presents a functional explanation that is testable. This is discussed in the section on suggested experiments.

14.2 Special Relativity

The Special Theory of Relativity does not describe reality

As noted in the background section, my introduction to Special Relativity (SR) came through a reference that claimed Einstein did **not** believe his theory was an accurate depiction of physics. Rather, he believed that the **basic assumption,** that light must be observed by each and every observer to be constant at the speed "c", which had recently become popular at the time, was **logically** unsupportable. To quell the "fad", he produced a paper, intending it to be a **negative proof**, that described the complex and contradictory physics that would result from such an assumption. He believed that by showing the world how bizarre physics would become, scientists would reject the idea. Repeating Auffray's comment from above,

> "His [Einstein's] **long-standing rejection** of **relativistic spacetime** and his life-long lack of acceptance of the quantum theory as it developed during his lifetime are well known… Einstein destroyed his manuscript shortly after his paper appeared in print. And he subsequently abandoned the line of reasoning he had proposed in this paper to establish the Lorentz transformation. No major physics textbook … has ever taken the pain to reproduce Einstein's original line of reasoning. Einstein himself never returned to it…" (Auffray 2007)

As we know, to the contrary, SR became the modern "standard model" for light speed physics.

SLT suggests that SR should be rejected as the "standard model" for light speed because its basic assumption, like those test assumptions used for indirect geometric proofs, is repeatedly proven wrong by logical tests of the application of SR.

This would create a controversial public relations situation for science that I want to emphasize. If SR is rejected, people will logically deduce that Einstein was wrong. No! Einstein was **not** wrong! His intention was to show, through an indirect proof, that assuming light speed is constant for all observers was unsupportable. What happened, instead, was the tragic promotion of his paper as truth. A lot of clarification will be needed in the public arena to explain this, and much introspection in the scientific community to explain why science has sustained this error for over a century.

Two key logical faults that doom the theory are the twin paradox, which includes various related paradoxes for time and distance, and the history paradox.

Twin paradox

The "Twin Paradox" arises due to the time dilation formula in SR. This formula and its context, taken directly from Einstein's paper, are (emphasis and paragraph identifiers added):

> [quotation 14.2-a] "…the time marked by the [moving] clock (viewed in the **stationary** system) is slow by 1 − SQRT(1 − v2/c2) seconds per second… From this there ensues the following **peculiar** consequence. If at the points A and B of K there are **stationary** clocks which, viewed in the **stationary** system, are **synchronous**; and if the clock at A is moved with the velocity v along the line AB to B, then on its arrival at B the two clocks no longer synchronize, but the clock moved from A to B **lags** behind the other which has remained at B by $1/2\ tv^2/c^2$ (up to magnitudes of fourth and higher order), t being the time occupied [according to the clock at B] in the journey from A to B." {Einstein 1923}

He adds for emphasis:

> [quotation 14.2-b] "It is essential to have time defined by means of **stationary** clocks in the **stationary** system, and the time now defined being appropriate to the stationary system we call it "the time of the stationary system." {Einstein 1923}

Because the velocity term in the formula is squared (per 14.2-a) , the time lag of the A clock is not affected by its direction of relative motion with respect to B. So clock A could be moving toward B, as in the given example, and its time measure slow down, or be moving away from B and still slow down. The implication for the Twin Paradox is that if the clocks at A and B, were instead, twin brothers, the one that moved from point A to B, would arrive at B younger than the one that remained at B. Einstein made it clear that this would include motion both toward B and away from B, and that the motion did not have to follow only a straight line:

> [quotation 14.2-c] "It is at once apparent that this result still holds good if the clock moves from A to B in any polygonal line… If we assume that the result proved for a polygonal line is also valid for a continuously curved line, we arrive at this result: If one of two synchronous clocks at A is moved in a **closed curve** with **constant velocity** until it returns to A, the journey lasting t seconds, then by the clock which has remained at **rest** [per 14-2.b] the travelled clock on its arrival at A will be ½ tv^2/c^2 seconds slow." {Einstein 1923}

Media reporters, trying to portray this in a more familiar setting, portrayed the journey of twin B as getting in a rocket ship, flying away at high speed, and then returning and being younger. This was why it was important that SR stressed that clock slowing occurs in both the outgoing and returning directions (per 14.2-c).

However, SR also expanded on the importance of another fundamental: that the primary assumption of the paper was that all observations were to be taken as **relative** measurements:

> [quotation 14-2.d] "It is known that Maxwell's electrodynamics—as usually understood at the present time—when applied to moving bodies, leads to **asymmetries** which **do not appear to be inherent in the phenomena**. Take, for example, the reciprocal electrodynamic action of a magnet and a conductor. The observable phenomenon here depends only on the **relative motion** of the

> conductor and the magnet, whereas the **customary view** draws a sharp distinction between the two cases in which **either** the one or the other of these bodies is in **motion**. For if the **magnet** is in **motion** and the **conductor** at **rest**, there arises in the neighbourhood of the magnet an electric field with a certain definite energy, producing a current at the places where parts of the conductor are situated. But if the **magnet** is **stationary** and the **conductor** in **motion**, no electric field arises in the neighbourhood of the magnet. In the conductor, however, we find an electromotive force, to which in itself there is no corresponding energy, but which gives rise—assuming equality of relative motion in the two cases discussed—to electric currents of the same path and intensity as those produced by the electric forces in the former case. Examples of this sort, together with the unsuccessful attempts to discover any motion of the earth relatively to the "light medium," suggest that **the phenomena of electrodynamics as well as of mechanics possess no properties corresponding to the idea of absolute rest**. They suggest rather that, as has already been shown to the first order of small quantities, the same laws of electrodynamics and optics will be **valid for all frames of reference for which the equations of mechanics hold good**."

The Twin Paradox arose when scientists addressed the problems raised by these statements in Einstein's paper. Einstein begins his paper claiming that Maxwell's electrodynamics makes false assumptions based on moving and rest conditions. Because of those assumptions, the explanation for the field structures and component interactions for the magnet and conductor depend on a need to place one at "rest". Einstein suggests that Maxwell's foundation is false, and that a single principle, the "same laws", meaning functional explanations and equations, must be sought that only depend on how the components are viewed by **any** observer, "**all frames of reference**", where the equations of mechanics are valid (per 14.2-d). However, after this introduction, Einstein, himself, fell back into the assumption of using a **stationary** state as the basis for his examples, as evidenced by his moving clock analysis (per 14.2-b). That was a serious mistake because it has led many others, both lay and scientific, to further misunderstand the misleading concept that Einstein had set out to expose.

The SR paper repeatedly used the terms "**stationary**" or "at rest" (per14.2-b) in reference to variables in calculations. The paper establishes that the observance of the motion was to be done from the view of clock B, which was **stationary** (per 14.2-b). This assumption, however, is in direct contradiction to the basic premise of **relativity** in the paper as emphasized in (14.2-d). When "relativity" is assumed, the observations from the "reference" frames of both clocks A and B have to be made using the "**same laws**" as proposed in the opening paragraph of SR. That means the roles of the two clocks can be reversed. If this were so, and the clocks were the biological clocks of the twin brothers, then each brother, upon meeting after their travel, would have to observe the other to be younger, which is logically impossible. So, the paradox occurs because either the brothers meet and have different ages or they don't. In either case, the basic assumption of the paper is refuted (which statements referenced in this paper claim was Einstein's intention for SR). If they do have different ages, then time and motion are NOT relative, but subject to some absolute reference. If they don't have different ages, then the equation predicting that clocks in relative motion will slow-down is not correct.

This did not sit well with those who had adopted the new "Relativity" fad. In defense, starting with the assumption that Einstein's clock example **must** represent physical truth, many related explanations were grasped, like life preservers, to save Einstein: the acceleration of the brother in the spaceship must resolve this; maybe it's the circular path; maybe along with high speeds comes a warping of space, and others. A Wikipedia article {39} about the Twin Paradox presents many of these variations.

The Twin Paradox, which is related to clocks, is important to resolve because the same type of confusion extends to measuring rod lengths and procedural timing. Twin brothers, both in rocket ships moving away from each other, will measure a relative velocity between them. If they both use identical measuring methods to measure the length of an object passing by them, according to SR, each should report that the other will announce a shorter dimension than they measured. This creates a dimensional paradox. If the measurement methods use light beams, and both twins attempt to document how the other performed their measurement, according to SR, they must both report that, while their own method was performed accurately, the other was not

truthful about synchronizing their measurements with the passing object. This creates a procedural paradox.

Without the ability to resolve observations to a **consistent truth** for clocks (time), object lengths (distance), and measuring simultaneity (process), no effective analytical or prediction theory can exist that would allow determination of any state of the universe. That is, every predicted state of the universe would be different for every observer. This creates a serious logical dilemma because it denies that there can be an absolute existence for any object, either by itself, or relative to another object.

Despite the association of SR with light speed "c", and the common belief that this means "nothing can move faster than 'c' ", SR does not actually set any maximum limit on the "absolute" speed of objects. All it says is that **observations** of objects using light as an instrument can not observe measurements with speeds greater than "c". Assume there are 3 objects, say, e, f, g. Along an X axis passing through "f". "e" is moving at -0.8 c and "g" is moving at +0.8c. If the three objects are coincident at T=0, then at T=1, an observer at "f" will describe the object universe as symmetric, with neighbors evenly spaced at 0.8c distance, spreading at 0.8c velocity. However, observers at "e" will not see a symmetric universe. Their world view will see a near neighbor at 0.8c distance moving away at 0.8c, velocity plus a second neighbor at a distance of 0.97c moving away at 0.97c velocity. Likewise, observers at "g" will also not see a symmetric universe. Their world view will see a near neighbor at -0.8c distance moving away at -0.8c velocity, plus a second neighbor at -0.97c distance moving away at -0.97c velocity. Attempts to describe the origin, gravitational state, and geometric future of each of these "visible universes" will produce very different results.

Reiterating this point, while SR provides **equations** that quantify expected relative observations, it produces multiple results that cannot be resolved to a single absolute model, thereby failing as a predictive theory for science. (which this paper claims was Einstein's specific intention for producing the SR paper).

Light transit history paradox

A key assumption of SR is that light must be viewed by **all** observers in valid reference frames as having the same "constant" speed "**c**". Einstein's paper uses light beams as

tools to measure time and distance. SR describes how light observations are to be interpreted both in the lab and over astronomical distances. What is missing from these descriptions is a discussion about light in an "absolute" sense. Once a light beam is created through some nuclear process, does it possess an independent "existence" of its own? Do it move as a distinct, real entity? This is a fundamental question for physics.

If we assume that light does have an independent existence, it is reasonable to assume it can interact, as in pass by many objects throughout the time period of an astronomical journey. This assumption can be examined to determine if it is able to fulfill the assumption of constancy for **all** observers at all times. There are serious **logical** problems related to such a journey.

We are able to observe objects that are billions of years old. If science is dealing with light as a physical reality, then statements that are made about the **distance** between earth and some star in some distant galaxy, need to be interpreted as having objective physical relevance. If humans did not exist during those billions of years, does science say that the concept of distances between stars had no meaning without conscious observers? What about time? If conscious entities capable of making time and distance measurements did not exist, did time also cease to have relevance for material interactions? Clearly, this can't be so, and it is not how the term "observer" is used in science. The term "observer" in science refers to a hypothetical process, whereby some measurement could have been made if some logical observer or instrument had been there. The anthropomorphic symbolism in the "observer" term merely provides a familiar model with which to describe the process. Nevertheless, even without the need for human consciousness, the concept of "observation" becomes a serious philosophical question because the answers form the foundation for relevance of scientific inquiry.

Making measurements of astronomical distances is typically done using ratios: astronomical units and parsecs for example. What about light years? In order for the unit we call a **light year** to have meaning, science must acknowledge that light, moving through space, must have some mechanism that determines the **time** it takes to traverse the distance between objects. A logical question which follows is, are such transit times "absolute" i.e. "**constant**" without the assignment of observers? That is, do all light beams passing without interruption, between two points in space, A and B, make the

passage in the same time interval? It seems pretty clear, that if this doesn't happen, then attempts at understanding cosmology using light speed as a measurement tool become very complicated. But the complication becomes insurmountable if these questions are raised for an SR universe.

Based on the assumption that there is some speed regulator throughout space, how then does light, which has been moving through space for 13 billion years, adjust its speed to conveniently be **precisely** "c" for an observer who encounters it moving at any arbitrary speed with respect to any other object? This is a difficult requirement. If science accepts that matter had a tangible self-existing distribution for the 13 billion years of the visible universe, and that light moved through that distribution for the same period, then for a group of photons which traveled together through space for those years, there must have been a 13 billion year **self-observed** history of transits past objects on its journey. That is, we can consider the photons themselves to be observers of object passage. So, how then could that entire prior 13 billion year history of the travel of those photons be adjusted upon approaching an arbitrary observer "A" so that the photon-observer time history of transits past all prior objects reflects the precise speed "c" for the frame of reference for observer A?

Put another way, once we know the motion of observer A and the point that A observes the photons, then, theoretically, the universal clock can be run backwards and the path of the photon can be traced backwards applying the speed "c" to its motion based on the motion of observer A's frame. To be consistent with the light speed assumption of SR, all of the photon-observer object transit times and distances of this theoretical backtrack would have to match those already established for its 13 billion year forward history. If one of the photons in the group were observed instead by a different observer "B", at the same point it was observed by observer A, but observer B's frame was moving at a very different speed from the frame of A, and the universal clock was run backwards, with the photon speed "c" now referenced from observer B's frame, all of photon B's transit history would still have to match the 13 billion year forward photon-observer history as well as the backward history for observer A.

There is no known, or even contemplated, physical mechanism that could **synchronize** a photon-observer **time history** of light transit, whether in its particle or wave character,

with any observer or any frame of reference controlled light speed other than through some universal transmission structure with which **all** observers must be referenced. If a local transmission structure anchored to the observer is contemplated with which the photon aligns its speed just prior to observation, then a description of this alignment must be presented as an "illusion", as in rainbows, that can be described by universally based references.

A new interpretation of Maxwell's Equation

Quotation 14-2.d states, "It is known that Maxwell's electrodynamics—as usually understood at the present time—when applied to moving bodies, leads to asymmetries which do not appear to be inherent in the phenomena… if the magnet is in motion and the conductor at rest, there arises in the neighbourhood of the magnet an electric field with a certain definite energy, producing a current at the places where parts of the conductor are situated. But if the magnet is stationary and the conductor in motion, **no electric field arises** in the neighbourhood of the magnet."

The SLT model for electromagnetic charges and magnetic fields suggests a different interpretation of the magnet-conductor interaction which eliminates the asymmetry between a stationary conductor and stationary magnet while simultaneously supporting a relativistic interaction. SLT suggests that charges in a wire, electrons, for example, produce fields whether they are in motion or not. Those fields exist even if they are masked by the fields of balancing positive charges. If measurements are made around a wire with balanced charge, no field is found. However, all the fields are there whether the wire is moving or not. Therefore, the magnetic field of any magnet is sufficient to induce forces on the electromagnetic charges in a moving conductor without the need to establish an electric field, because the electric field of the electromagnetic charge will directly interact with the magnetic field of the magnet. As the field of the electric charge crosses the "field lines" of the magnet, forces will be induced.

Atomic clock test of Special Relativity

In 1971, Hafele and Keating {Hafele 1972} flew 4 cesium beam atomic clocks on commercial jet flights around the world, once eastward, once westward. The paper abstract states (emphasis added),

> "From the actual flight paths of each trip, the theory predicts that the flying clocks, compared with reference clocks at the U.S. Naval Observatory, should have lost 40 ± 23 nanoseconds during the eastward trip, and should have gained 275 ± 21 nanoseconds during the westward trip."

While the study attempted to be very thorough, and did a good job controlling errors with the early atomic clocks time drifts, gravity effects, latitude and flight parameters, there were serious logic problems interpreting and incorporating SR principles. The clock motion model used in the paper's hypothesis is not consistent with Einstein's model. The Hafele paper states:

> "Special relativity predicts that a **moving** standard clock will record **less** time compared with (real or hypothetical) coordinate clocks distributed at **rest** in an inertial reference space. … **Because the earth rotates**, standard clocks distributed **at rest on the surface** are **not suitable** in this case as candidates for coordinate clocks of an inertial space. Nevertheless, the relative timekeeping behavior of **terrestrial clocks** can be evaluated **by reference to hypothetical coordinate clocks** of an underlying **non-rotating** (inertial) space."

> The paper's statement is supported by a long footnote:

> "It is important to emphasize that special relativity purports to describe certain physical phenomena only relative to (or from the point of view of) **inertial reference systems**, and the speed of a clock relative to one of these systems determines its timekeeping behavior. {Hafele 1972}

These statements in the paper ignore and contradict three important points related to SR.

First, as discussed above, no **preferred inertial reference** can be assumed for SR. If SR is used as stated in the quote labeled 14.2-c, as referenced to a land based clock, the clocks on the aircraft, as observed by a ground observer, should always slow down, as they move on along a closed curve. Conversely, from the frame of reference of the aircraft, the times observed by the ground observers should appear to slow down. This is the Twin Paradox.

Second, in SR, using the same quote labeled "14.2-c", **curved motions** of clocks are not disqualified as valid frames.

Third, the study, which attempted to be very thorough, added two additional speed adjustments. One was a cosine term, "a slightly modified directionally dependent term" to extract the east and west components of travel for flight paths that were not parallel to the equator. The second was a cosine adjustment for the latitude of the reference clock at the Naval Observatory. The first cosine term, to account for motions not parallel to the equator, is **not valid**. This was explained by quotation "14.2-c" in relation to curved paths. And while the SR analysis can infer a planer curved path, it is easy to extend this to any 3-D path.

The biggest problem with the Hafele – Keating paper is that it misapplies SR. Believing that clocks on the earth's surface or flying above it were not in "stationary" reference frames, they established a theoretical clock at the North Pole as their reference clock. All time measurements were made relative to that clock. The irony of this choice was that, a clock moving close to the earth's surface on a generally east-west path, had very little relative motion with respect to the reference clock along a line between the moving clock and the reference clock (away from or toward), which was the basic example in the SR paper.

Although the Hafele – Keating paper completely misapplies SR, it provides data that can be used for analysis with the SLT model.

SLT suggests that the Lattice, while affected by the earth's mass, is only slightly affected. So, while the Lattice may be observed to have significant linear velocities with respect to the earth, it's rotational rate would only be slowed slightly in reference to the distant stars. Therefore, modeling the Lattice for this experiment, the rotational speed of

the Lattice with respect to the earth would be approximately equal to the magnitude of the earths rotational speed in the opposite direction to the earth's rotation. A best fit analysis of the Hafele study data done for this SLT paper suggests the Lattice was rotating slightly in the direction of earth rotation with a surface equivalent velocity of approximately 30 mph at the latitude of the Naval Observatory.

With that condition, the aircraft and clock flying west at 394 mph would experience a **Lattice** speed of: 832 (earth rate at reference latitude) – 30 (Lattice rate) – 394 (aircraft speed) = 408 mph. This slows the clock by 32ns over its flight time from a Lattice referenced clock (Lattice time) using a standard Lorentz transformation which SLT accepts and explains. The reference clock at the observatory is rotating through the Lattice at the earth rate minus the Lattice rotation: 832 (earth rate) – 30 (Lattice rate) = 802 mph. This slows its clock 126 ns over the same flight time, again, using a standard Lorentz transformation. The clock flying east at 465 mph experiences a Lattice speed of: 832 (earth) – 30 (Lattice) + 465 (aircraft) = 1,267 mph. This slows its clock by 313 ns over its flight time. Relative to the reference clock, this produces an apparent speed up of the westward flying clock by **+93 ns** and a **– 188 ns** slow down of the eastward flying clock. These values compare very closely with the "kinematic values", +96 ± 10, and -184 ± 18 shown in the paper.

Correctly applying the analysis directly from SR, the relative velocities of the planes are their flight speeds with regard to the reference clock. This gives predictions of slowing for both flight clocks as it should: the westward flying clock by -30ns, the eastward flying clock by -42ns. These values are not even close to the observed values.

This analysis provides strong empirical support for SLT, and, conversely, strong disagreement with SR.

The special case of light speed for observer preference

In the discussion of the light history paradox, a question was raised about the fundamental nature of light: does it have an independent existence of its own? There are light based phenomenon other than light speed that do **not** maintain light beam independence, but do demonstrate preferential "constancy" for an observer.

If a street lamp, with a spherical dome used to disperse light uniformly in all directions, is observed across a stretch of water, an observer will not report a uniform spherical light pattern. Instead, they would report that a **beam** of light is being emitted from the street lamp that **preferentially** points directly to them. If the observer moves, in **any** order of motion, uniform, accelerating, discontinuous jerks etc., the beam follows **them**. The claim of the observer is supported by the appearance of a bright reflection in the form of a beam on the water surface. Multiple observers can report the same phenomenon at the same time, with the implication that the street lamp somehow creates an individual "smart" beam for each observer. If a translucent material is hung between an observer and the light, it is uniformly illuminated with no detectable beam. If a person goes over to the street lamp and wraps part of it with a translucent band, in an attempt to detect the beams, none are seen. What is observed is a uniformly illuminated band that is unchanging despite the claims of observers.

After a localized rainstorm, observers with their backs to an exposed sun often report seeing a rainbow. Each of these observers reports similar parameters for the rainbow. The rainbow appears to be part of a circular pattern. A line drawn from the sun to the virtual center of the rainbow pattern passes vertically over the observation point. If the observer moves, the line overhead and the points where the rainbow intersect the ground move to follow the observer's motion. If there are additional observers in the area, they each report observing the same phenomenon as unique to themselves, stating the same geometry applies to them.

If there is a monument in a field, and an observer enters the field to view the monument, the observer might report that the monument is very clever and preferential to them. The monument appears to generate an image of itself and transmits that image to the observer who then "sees" the monument. But the monument carefully selects a view of itself that only includes part of its surface bounded by lines from the observers eyes that pass tangent to the monument. The observer might conclude that this supports the light theory of Pythagoras. If the observer moves in any direction, the monument adjusts the image it sends. If the observer removes their glasses, the monument, again, adjusts and sends a blurred image. If the observer puts on "sun glasses", the monument adjusts further and sends an image in which the colors are

changed. Multiple observers can enter the field at the same time. Each of them claims to have the same experience, preferential to themselves, simultaneously. If an assistant goes over to the monument and wraps part of it with a translucent band, in an attempt to detect the images being emitted, none are seen. But the observers in the field then report that the translucent band and the assistant have joined in transmitting images of their own, while the monument adjusts its own image again including a cutout for the outline of the translucent band and assistant, again aligned along visual projection lines from each observer tangent with the translucent band and assistant. This is done for every observer in the field, no matter how many there are.

The point of listing these examples is that they demonstrate light transmission phenomenon that are "relative to the observer" as is the case with SR. However, all three have well understood phenomenon which explain why an observer believes their experience is unique to them, yet the fundamental structure of the light transmission involved is **not** preferential to them. All three examples are explained by simple mechanisms that would pass the photon-observer history paradox test. And, all three examples involve the transmission of light. The claims of "observer preference" for light speed "c" is a special case that is not valid for other "observer preference" light transmission phenomenon.

Inability to define a stationary or rest frame

SR relies on a universe in which the **speed** of an object in **linear** motion cannot be known without reference to external datum points. While not discussed in SR, absolute measures of position of an object in space also require reference to external datum as does absolute rotational orientation. These three references are the only spatial conditions with the external datum requirement. Acceleration, and the higher time derivatives of dimensional motion can be measured inside a closed vehicle without any external reference using an accelerometer. Rotation rate and higher time derivatives of rotation can also be measured inside a closed vehicle without any external reference using a gyroscope.

Based on this summary, the case of object motion in a straight line is seen to be a special case and produces an asymmetry between linear and rotational motion. If the properties of rotation and linear motion were **symmetrical** with respect to **time**

derivatives, the following parallels would occur: position and orientation – zero time derivative – datum required; linear velocity and rotational velocity – first time derivative – measurable; linear acceleration and rotational acceleration – second and higher time derivatives – measurable. No fundamental principles for the construction of space are accepted that explain why this asymmetry exists.

SLT suggests that the Lattice principle offers a possible resolution to this asymmetry. Motion of any object through the Lattice must disturb the Lattice, and therefore interact with the Lattice. If an ability to sense Lattice motion is developed, then the asymmetry will be overcome.

Theoretical SLT observation summary for SR

1. SLT rejects the suggestion that the speed of light is constant with respect to all observers. In SLT, the speed of light is only constant with respect to the LATTICE.

2. SLT suggests that historical observations are correct that state Einstein wrote the Special Relativity paper, not to support a relativistic light speed phenomena, but to discredit it using an indirect proof.

3. Observations of phenomenon made using light that suggested measurements are subject to SQRT(1 − v2/c2) distortions preceded Einstein's paper, having been made earlier by Lorentz and others. SLT suggests that the Space Lattice presents and describes a mechanism that supports and explains Lorentz contraction, but based on a tangible universal reference frame rather than a purely relativistic model.

4. SLT suggests that the Twin Paradox, Light Transition History Paradox and multiple observer paradoxes of SR arise due to the misleading attempt to support an observer referenced light speed constancy. SLT does not produce any of these paradoxes.

5. SLT suggests that the basic Maxwell magnet-conductor interaction model is incorrect, and provides a functional explanation for an alternative model.

6. Unlike Special Relativity, which produces universe descriptions individualized for multiple observers that cannot be resolved into an absolute model of the distribution of matter, SLT produces a model that supports a single absolute universe.

7. SLT supports the SR claim that **relative** motion drives the interaction of magnets and conductors, but does not agree with SR's description of why the Maxwell model fails. SLT suggests that Maxwell's model for electromagnetic field interactions will not hold for fast moving fields because such field will be distorted by the Lattice Relaxation Response.

8. SLT does not require different field models for magnets or conductors either stationary or in motion relative to the Lattice. That is, SLT provides a unified theory for electric and magnetic fields.

9. SLT suggests that light transmission conforms to simple transmission principles based on the Space Lattice.

10. SLT disputes the analytical conclusions of moving atomic clock time changes made by Hafele and Keating and shows, using their primary data, how the measurements are accurately explained by the Lattice model.

11. SLT provides examples for light beams on water, rainbows and images that appear to be "observer preferential" but explains how the preferential observations are illusions.

12. SLT discusses the mathematical foundation of spatial absolutes, and resolves the asymmetry of constant linear motion introduced by SR by giving constant linear motion an absolute reference: the Lattice.

14.3 The General Theory of Relativity

Failure to justify a mechanism for a field in space

In Einstein's paper titled Relativity: The Special and General Theory (GR) the opening paragraph of the General Relativity section on the gravitational field states, (p57)

> "If we pick up a stone and then let it go, why does it fall to the ground ? The usual answer to this question is: 'Because it is attracted by the earth.' Modern physics formulates the answer rather differently for the following reason. As a

> result of the more careful study of electromagnetic phenomena, we have come to regard action at a distance as a process impossible without the intervention of some intermediary medium. If, for instance, a magnet attracts a piece of iron, we cannot be content to regard this as meaning that the magnet acts directly on the iron through the intermediate empty space, but we are constrained to imagine — after the manner of Faraday — that the magnet **always calls into being something physically real in the space around it**, that something being what we call a 'magnetic field.' In its turn this magnetic field operates on the piece of iron, so that the latter strives to move towards the magnet. **We shall not discuss here the justification for this incidental conception**, **which is** indeed a **somewhat arbitrary** one. We shall only mention that **with its aid electromagnetic phenomena can be theoretically represented much more satisfactorily than without it**, and this applies particularly to the transmission of electromagnetic waves. **The effects of gravitation also are regarded in an analogous manner.**"

Einstein explains this field concept in relation to gravity in more detail:

> "The body (e.g. the earth) produces a field in its immediate neighbourhood directly; the intensity and direction of the field at points farther removed from the body are thence determined by the law which governs the properties in space of the gravitational fields themselves." {Einstein 1916}

What neither Einstein, nor science, has yet provided is a tangible description for the "something **physically real**" in Einstein's description for either electromagnetism or gravity. In fact, he honestly attempts to avoid providing a justification, saying, "We shall not discuss here the justification for this incidental conception, which is indeed a somewhat arbitrary one." But, immediately after this statement, he does provide a justification for using the concept of a "**field**" stating, "with its aid electromagnetic phenomena can be theoretically represented much more satisfactorily than without it." While reinforcing the pragmatism of using field mathematics, this "justification, is no different from the justification for the concept of a "vacuum". Given that a vacuum has been determined to be a "non-entity", this justification by GR can in no way be used to **support** the existence of a field.

Failure to prove the generalizability of the relativity concept

Einstein presents an example of a man in a box being accelerated by an outside force that is compared to observations of a similar man-box experiment done in a gravity field. He shows that the results are indistinguishable. From this example, he concludes: "We have thus **good grounds** for **extending the principle of relativity** to include bodies of reference which are **accelerated** with respect to each other, and **as a result** we have gained a **powerful argument** for a **generalised postulate of relativity**."

This SLT paper suggests that Einstein's comparison is misleading and his conclusion is incorrect due to the following problems:

1. The inconsistent use of the term "relativity". The principles in SR that underlie observations of light speed for observers based on relative measures are fundamentally different from those in GR that underlie observations of accelerations and forces.

In the first case, "relativity" is used to describe how measurements of **light speed** are to be **interpreted** with regard to **each** of **many** observers. This use states that all of these measurements must be interpreted to have the same value "c" thereby causing measures of distances, masses and times of all object observations to be altered.

In the second case, "relativity" is used to **focus our attention** on a **single observer** who is making measurements of **acceleration** and **gravity** in the presence of a gravity field. This use states that the measures of acceleration and gravitational force cannot be distinguished, implying that any attempt to distinguish them will fail. There is no single tangible principle presented by which these two very different uses can be logically compared to support a generalization.

2. Using the example Einstein gives in a slightly altered form produces a result that does not support generalizability. Using the example of the closed box, if a rope is wound around the outside of the box, rather than attached at a point near the center, the box would spin; the spin would be easily detected; and the "generalizability" postulate would fail.

3. Einstein, himself, recognized a number of problems to generalizing relativity. He specifically pointed this out, titling a section of his paper, "In What Respects are the

Foundations of Classical Mechanics **and of the Special Theory of Relativity** Unsatisfactory?" He summarizes these problems as follows:

> "We have also repeatedly emphasised that this fundamental law **can only be valid** for bodies of reference K which possess certain **unique states of motion**, and which are in **uniform translational motion** relative to each other. Relative to other reference-bodies K the law is not valid. Both in classical mechanics and in the special theory of relativity we therefore differentiate between reference-bodies K relative to which the recognised " laws of nature " can be said to hold, and reference-bodies K relative to which these laws do not hold."

That is, Einstein, himself, understood that "relativity" is **not** a general theory, but a special theory applicable only to the special case of **uniform translational motion**. This is important because it relates to his SR analysis as an indirect proof to reject light constancy with respect to the observer.

4. Einstein has provided no explanation to explain how either of the "relativity" phenomena work. So, even if the term "relativity" were used consistently, the cases where it was found to apply could as easily be addressing a coincidental indirect connection to some second principle, as the discovery of a new generalized principle.

5. There is a serious logical fault in Einstein's example of two pans on a gas range from which steam is coming only from one. He says,

> "I shall remain **astonished** and **dissatisfied** until I have discovered some **circumstance** [i.e. tangible, verifiable principle] to which I can attribute the different behaviour of the two pans. Analogously, **I seek in vain** for a **real something** in classical mechanics (or in the special theory of relativity) to which I can attribute the different behaviour of bodies considered with respect to the reference systems K and K'…"

Not being **aware** of a principle that meets the criterion of his sought-after "real something", he claims:

> "It [the dissimilar-pan like behavior of different reference systems] can only be got rid of by means of a **physics** which is conformable to the **general** principle of relativity, since the equations of such a theory hold for every body of reference, whatever may be its state of motion."

This conclusion is, of course, absurd, stating, in short: 'if **I'm not aware** of any other way to explain this, my **complex** and **nonsensical** approach **must be right**.'

Based on these five unresolved problems alone, without regard to many other challenges presented by others, this paper suggests that Einstein's comparisons are misleading and his conclusion is incorrect.

Directly addressing problem four, SLT does provide a "**real something**" explanation for the questions that led to Einstein's study of light speed. Using the Lattice as a basis, explanations are provided for why the gravity and acceleration observations do not apply to things like rotation.

SLT also addresses the real-life differentiation between gravity and acceleration. Acceleration applied to an object, such as Einstein's box, can not duplicate **real** gravitational fields (as opposed to hypothetically uniform gravitational fields) because gravity will always have a gravity gradient which could theoretically be measurable, and be different from an external acceleration. The SLT gravity model supports this.

Relativity and the bending of light

In the GR section titled: "A Few Inferences from the General Principle of Relativity", Einstein applies his observation of the behavior of an observer measuring forces in a closed box to explain the bending of light in a gravity field. He claims: a. an observer in an accelerating box must observe an object moving in rectilinear motion to appear to move in a curved path; b. the observer is unable to distinguish gravity from mechanical acceleration; c. light moves in a **rectilinear path**; therefore d. gravity bends light.

This logic can be easily shown to be unsupportable. Assume the acceleration "observer" is an instrument. What if the sensing portion of the instrument and the box are made from a magnetic material and placed in a magnetic field, rather than a gravitational field. Then the observer would not be able to distinguish acceleration from magnetism.

Does that automatically imply that light would bend in a magnetic field? No, it doesn't, and we do not observe such an effect in physics.

SLT suggests Einstein's explanation of the curvature of light by gravity is **not** due to a need for all reference frames to be equivalent in a "relativistic" sense, but rather, that mass produces a gravity field in space. The gravity field will bend light passing through it. To be consistent with the SLT description of "light", the gravity field must bend the path of two forms of light: photons and waves.

1. The gravity field will bend the path of photons toward its source mass due to the mass property of the photon core dislocation.

2. The bending of true light waves, however, is caused by a different mechanism: refraction. As stated earlier, SLT suggests that light refraction occurs within dense materials due to longer Lattice path lengths in the materials. The longer path lengths are due to the Lattice distortions caused by gravity field creation. If the structure of a gravity field is mapped based on wave path length, it appears as a "strain gradient". The longest path lengths (greatest elongation of Aas), occur at the highest gravity field strength, which occurs at the surface of a massive object. The Aa elongation decreases in direct proportion to the gravity field to a minimum in the vacuum of space. True Lattice waves are bent by refraction due to this gradient just as they would be due to path length changes in dense matter.

Ironically, this "equivalence" of effect for two different "light" phenomenon, gravitational bending of photon paths, and refractive bending of waves by gravitational field distortions, creates a new subject for investigation just as Einstein's questioning of inertial and gravitational mass. SLT provides an advanced start on these investigations because it explains the mechanics of gravity creation on Lattice distortion. In contrast, considering magnetic field formation, SLT suggests why neither the paths of photons nor waves will bend toward a magnetic source, while the twisting nature of the magnetic field will cause other effects for both the photons and waves.

Existence of a "Newtonian" great universe

In the section of GR titled: Cosmological Difficulties of Newton's Theory, Einstein rejects the existence of a "Newtonian" great universe with a generally uniform mass distribution. He bases his rejection on a **model** for the phenomena of mass and gravity whereby the: "number [quantity] of 'lines of force' coming from infinity and terminating in a mass m is proportional to the mass m." Field strength is equated with line count per unit area. A geometric analysis using this model rejects the model based on it producing infinite field strength with decreasing r. This method of rejection was disputed in many ways as summarized by Norton {Norton 1999}. It is also clearly disputed by Newton's shell theorem which produces zero field strength at r=0.

SLT provides additional suggestions to dispute the rejection of a "Newtonian" great universe:

1. Field strength in SLT is related to the amount of bending in the Lattice. This suggests a continuous function for field strength, rather than the quantization of "lines of force".

2. The fact that bending is limited to maintain Lattice continuity, suggests there many be nonlinearities introduced by the Lattice at high levels of field strength.

3. The Lattice is quantized at the Aa scale. Fields that combine in space are not simple additions of independent "lines of force" as if the lines were tangible entities emanating from a mass. The wave nature of fields in SLT requires **all** additive components of fields to resolve at every point of interaction. For example, two strong fields pushing in opposite directions, do not, as would be suggested by the Newtonian model, created a jumble of crossing field lines, but rather, result in a section of the Lattice with very little disruption from undistorted Lattice.

So, with all these challenges to Einstein's basic assumptions about the shape of the universe, GR can not be used to discount the Newtonian conclusion of an infinite 3-D universe with extensively distributed mass.

Problems with experimental confirmations

Concerning the experimental confirmation descriptions in appendix III of the GR reference, Einstein's following words are an important guideline:

> "Corresponding to the same complex of empirical data, there may be several theories, which differ from one another to a considerable extent. But as regards the deductions from the theories which are capable of being tested, the agreement between the theories may be so complete that it becomes difficult to find any deductions in which the two theories differ from each other… up to the present we have been able to find only a few deductions from the general theory of relativity which are capable of investigation, and to which the physics of pre-relativity days does not also lead, and this despite the profound difference in the fundamental assumptions of the two theories."

In other words, science has amassed a great amount of empirical data. Science has also produced many theories that are very different from each other and come to very different conclusions. But because of limitations in what can be tested, at the time GR was published, there were only a few of its conclusions that were different from classical physics which could be tested.

The history, in this regard, is not good for the following reasons:

1. Errors interpreting GR and SR principles. Relativity is conceptually difficult at the detail level. Due to the difficulty of the math involved, the impatience of scientists to get quick results, and the inability of a competitive education system to work together with strict integrity toward the goal, the rigor needed to get clearly discriminating well supported results has not been applied. The result has been the introduction of massive confusion and disagreement into the process.

2. Errors in the understanding of classical physics, errors controlling experimental error, failure to adequately research primary sources, and the lack of independent verification using alternative methods. This is the classic case of

Michelson – Morley and the history of follow-up verifications discussed elsewhere in this paper.

3. Distortions in the popular media. Not willing to put in the effort to adequately understand scientific results and wait for independent verification, the media has misreported and incorrectly explained observations. Scientific impatience has led to reliance on media misinformation, further confusing the science. Again, the Michelson – Morley saga is the poster child for this problem.

4. Cases of scientific fraud (e.g. Eddington)

5. Control of scientific research by big money with no peer oversight.

This means, it is important that a few **apparent** confirmations not be accepted as confirmation of **generalizability**, especially in light of the challenges discussed in this section of this paper as well as other sections. Again, in Einstein's words:

> "I shall remain astonished and dissatisfied until I have discovered some circumstance to which I can attribute the different behaviour of the two pans. Analogously, I seek in vain for a **real something** in classical mechanics (or in the special theory of relativity) to which I can attribute the different behaviour of bodies considered with respect to the reference systems K and K'…"

14.4 The Standard Model

The term "Standard Model" is used to describe a current list of subatomic particles and their interactions. Details of the SM were discussed previously. There are significant shortcomings with this model as presented in the following summary:

"The Standard Model of particle physics is a theory concerning the electromagnetic, weak, and strong nuclear interactions, which mediate the dynamics of the known subatomic particles. It was developed throughout the latter half of the 20th century, as a collaborative effort of scientists around the world. The current formulation was finalized in the mid-1970s upon experimental confirmation of the existence of quarks. Since then, discoveries of the top quark (1995), the tau neutrino (2000), and more recently the Higgs boson (2013), have given further credence to the Standard Model.

Because of its success in explaining a wide variety of experimental results, the Standard Model is sometimes regarded as a 'theory of almost everything'.

The Standard Model falls short of being a complete theory of fundamental interactions. It does not incorporate the full theory of gravitation as described by general relativity, or predict the accelerating expansion of the visible universe (as possibly described by dark energy). The theory does not contain any viable dark matter particle that possesses all of the required properties deduced from observational cosmology. It also does not correctly account for neutrino oscillations (and their non-zero masses). Although the Standard Model is believed to be theoretically self-consistent and has demonstrated huge and continued successes in providing experimental predictions, it leaves many phenomena unexplained…

There are also important questions that it does not answer, such as "What is dark matter?", or "What happened to the antimatter after the Big Bang?", "Why are there three generations of quarks and leptons with such a different mass scale?" {38}

SLT does not deny that rigorous observations have been made upon which the suggested list of particles in the current model and the magnitudes of forces in their interactions have been made. SLT does suggest, however, that the physics of how particles are created and interact is incorrect and hopelessly complicated on all accounts for reasons described in the sections of this paper about particle accelerators and elementary particles. Hopefully, the new concepts presented here will lead to experiments that can provide accurate understandings of the physics involved.

14.5 Cosmic Microwave background

SLT does not support the physics describing the Cosmic Microwave Background (CMB). According to the current standard model,

> "The cosmic microwave background (CMB) is the thermal radiation left over from the 'Big Bang'… When the Universe was young, before the formation of stars and planets, it was denser, much hotter, and filled with a uniform glow from a white-hot fog of hydrogen plasma. As the Universe expanded, both the plasma and the radiation filling it grew cooler. When the Universe cooled

> enough, protons and electrons combined to form neutral atoms. These atoms could no longer absorb the thermal radiation, and so the Universe became transparent instead of being an opaque fog… The photons that existed at the time of photon decoupling have been propagating ever since, though growing fainter and less energetic, since the expansion of space causes their wavelength to increase over time (and wavelength is inversely proportional to energy according to Planck's relation." {11}

The biggest problem with CMB theory is that the empirical observations are too closely tied to theoretical development. If the experimental observations try to "prove" the theory, and the theory tries to "model" the observations, it is easy to get fooled by islands of local "reinforcement", which miss the true nature of the problem. Alchemy and "angels dancing on the heads of pins" were prime examples. Once the "3 Degree Kelvin Background Radiation" is associated directly, and exclusively, with the "Hot Big Bang" model, then both theory and experiment are driven to support their association and exclude other options. In the case of CMB, there are many inconsistencies:

1. "The local group of galaxies, to which the Earth belongs, is moving at about 600 km/s with respect to the background radiation. It is not known why the Earth is moving with such a high velocity relative to the background.." {10}

2. The "Hot Big Bang" model requires the universe to **somehow** "expand". The theory behind this is that, "the expansion of the Universe for 15 billion years … causes the radiation originally produced in the big bang to redshift to longer wavelengths…" The term "expand", and the related principle of "expansion cooling", however, relate to a concept taken from thermodynamics in which the temperature of molecules in a closed volume changes if the volume is changed. BUT, the change in molecular temperature is related to "the attractive part of the **intermolecular force**…" "expansion causes an increase in the potential energy of the gas…" To maintain conservation of energy, the increased potential energy results in, "a decrease in kinetic energy and therefore in temperature." {25} None of these phenomenon apply to electromagnetic phenomenon. The concept of an "expanding universe" more specifically referred to as the "metric expansion of space" is without a fundamental foundation in physics.

3. The measured CMB distribution "is homogenous and isotropic, but only on very large scales. For scales the size of super clusters and smaller the luminous matter in the universe is quite lumpy…"{10}

SLT provides a number of new suggestions related to understanding the Cosmic Microwave Background:

1. SLT provides multiple energy exchange alternatives for the CMB, including both heating and cooling models. SLT provides a visualizable foundation for the expansion and contraction of space, that does not contradiction basic physics principles.

2. The SLT Big Bang would have caused huge disturbances in the Lattice, with multiple reverberations. These reverberations would have been distorted by mass expanding in the Lattice. At our current point in time in visible universe development, the CMB could be residual Lattice response from that event. This view is consistent with current cosmology.

3. SLT suggests that the visible universe is not alone. Therefore, disturbances from other Big Bangs long before our own, and far away from our own, could be providing some of the CMB we see.

4. SLT supports the loss of energy for all motions of matter or energy that move in non-steady state patterns. For example, charged particles that move in circles and create "steady state" magnetic fields lose little energy to the Lattice. However, every charged particle moving through the Lattice in a straight line or far field curve will dissipate energy to the Lattice. Photons and light moving through the Lattice will dissipate energy. SLT suggests that this phenomenon would appear as Lattice vibration energy, and become a sustaining energy sources for the CMB.

5. Due to continuous energy loss of photons, those that aren't captured by matter may eventually drop to such a low energy state that they can no longer be captured. That means, they are doomed to bounce around the visible universe, or leave the visible universe and travel to other local universes until they are

captured by black holes and destroyed. As they are pulled into a black hole, they would heat up the Lattice they pass through.

6. SLT suggests that the Lattice supports vibrations that can be detected as radio waves or light waves which are not photons. These waves always lose energy passing through the Lattice and can decay to zero energy. These losses would heat the CMB.

14.6 Dark Matter, Dark Energy

The concepts of Dark Matter and Dark Energy have been suggested to explain observations of cosmic behaviors that can't be otherwise explained by prior theories. For example, the concept of Dark Matter was suggested to explain observations of galaxies that are, "rotating with such speed that the gravity generated by their observable matter could not possibly hold them together; they should have torn themselves apart long ago."{14} The addition of matter to the galaxy could create the additional gravitational field to balance the high rotation speed. The needed matter is called Dark because, if it is there, it is not visible. "Dark matter seems to outweigh visible matter roughly six to one, making up about 26% of all the matter in the universe. Here's a sobering fact: The matter we know and that makes up all stars and galaxies only accounts for 4% of the content of the universe!"{14}

The suggestion for Dark Energy arose to provide an energy source to explain the observed acceleration of expansion of the universe. {13}

SLT suggests two concepts related to this phenomenon.

1. The suggestion that photon "red shift" could remove enough energy so that the photon can no longer be captured except by black holes begs two questions: where are these photons as they roam around the universe waiting to be captured; and how many of them are there? The importance of these questions for Dark Matter is that, SLT's suggestion that low energy photons carry true mass that is not detectable could provide an explanation, as long as a sufficient amount is available.

2. The SLT models for red shift and the Big Bang could alter the suggestion that the visible universe is expanding, or at least expanding at a high rate. That being the case, a Dark Energy model is no longer needed, independent of the need for Dark Matter.

14.7 Radiation belts around the earth

In the discussion of the light transmission controversy and SR, SLT suggested that large masses, like the earth, which rotate in space, can entrap the Lattice, forcing it to rotate with their mass.

The far field Lattice must be stationary in rotation with respect to the **distant** stars. This is due to the fact that the speed of **any** object or energy in the Lattice is limited to "c" by the LRR. The corollary is that the linear velocity of the Lattice, with regard to any object, must also be less than "c". Using a very distant star as a reference, the maximum speed of the rotational component of the Lattice must not exceed the speed "c" perpendicular to the line of sight to the distant star, at the distance of that star. Using a distance of 13.8 B light years as a minimum value (there are many larger estimates), the rotational rate of the Lattice with respect to the "distant" stars, as viewed from any point in the visible universe, is less than $360/(2\pi \times 13.8B) = 4.15 \times 10^{-9}$ degrees/year. This is negligible compared with the rotation rate of the earth, for example, which is 15 degrees / hr .

The analysis of the Hafele and Keating atomic clock data suggested a Lattice drag of 30mph at a latitude where the earth rotation was 832mph = 0.5 degrees per hour sidereal time. This is against the zero degree rotation of the Lattice. There should be observable consequences for this rotational difference because there must then be some **transition zone** between the fast rotation of Lattice entrapped by the earth and the stationary Lattice.

In such a "transition zone", the Lattice can **not** be continuous, but must continually break and reform long structure elements. It is logical to expect that such a process would not allow the perfect reformation of structural lines without the introduction of some new dislocations into the Lattice. This would appear as radiation, specifically, photons, which would carry the mass produced by the dislocations.

This SLT observation could be supported by research done at Los Alamos:

> "According to Dr. Geoffrey Reeves of Los Alamos National Laboratory and an investigator for ISTP, the solar wind and Sun are insufficient sources for the radiation belts. 'There are just not enough high-energy electrons in the solar wind to explain how many we observe near Earth.' " {17}

Theoretical SLT observations for radiation belts around the earth:

1. All objects in space, which have rotational rates exceeding on the order of 10^{-9} degrees /yr. relative to the distant stars, that have enough mass for their gravity field to rotationally entrap Lattice, will cause radiation generation in their vicinity due to the disruption of Lattice long structure lines.

15 Recommended Research

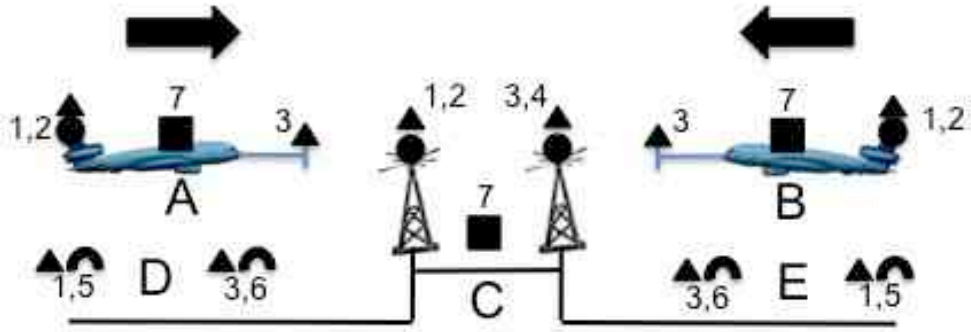
15.1 Speed of light challenge

The controversy over the nature of light is one of the most important current issues for physics to resolve to set a broadly agreed to stage with **no** loose ends for a better understanding of the fundamentals of matter. To resolve the disagreements related to Special Relativity, **breakthroughs** will be needed in the understanding of the most basic fundamentals of matter and energy.

To this end, I propose the following experiment. The goal of the experiment is to devise an arrangement of instruments and test protocols that will **resolve** one of the oldest and most important questions of physics: how is light transmitted. The proposed experiment attempts to resolve which of the 3 classical transmission models are correct as the determinant of light speed: source, medium or observer. If the experiments are still not conclusive, this would force research along some new lines of thinking.

It is important that the experiment be designed with two overarching goals: 1. To test, and discriminate, all three possibilities **simultaneously** so that no confusion remains. 2. To involve **researchers** from around the world to suggest relevant considerations for the test so that all objective views of the phenomenon can be addressed and extenuating circumstances dealt with.

I used the term “researchers” specifically so input will not be limited only to academic institutions. Much of the controversy is raised by people who have left academia due to suppression of their views. Others are working in industry, without academic standing or support for publication, but who have extensive knowledge and insight into the problem. Another necessary approach is to avoid using measurement tools developed for one model, SR specifically, as the tools to make measurements for the other models. SR, for example, employs light beams for synchronization of clocks and the lengths of objects, which send the reference beams through the same environment that carries the test beams. This is not necessary if the clocks and measuring rods can be brought close enough together so the test and reference beams have radically different paths.



Objects and distances are not to scale

Frame designators (A,B,C)

Light Sensor (1,3)

Light Beacon (2,4)

Location marker (5,6)

Clock (7)

Fig. 30

Experiment to resolve the mechanism of the speed of light

Comprehensiveness, also requires that **all** measuring concepts be applied to all three models for comparison.

Figure 30 above shows a "hypothetical" test setup. It is beyond the scope of this paper to develop the details needed for this arrangement. The setup attempts to create 3 reference frames – A, B, C - so that for each test run, each of these frames, which reference one of the transmission methods: source, medium, observer; can be examined as a frame of reference for itself plus the other transmission frames. However, with the suggested setup, all three reference frames are valid because they are in constant speed linear motion.

The elements of the setup are: light sensors 1,3 (items marked 1 and 3 in the figure); light pulse beacons 2, 4; location markers 5, 6; clocks 7. Stations D and E are part of frame C. The distances A2-A3, B2-B3, C2-C3 and C4-C1 form mechanically rigid rods in frames A and B. The distances D5-C1 and E5-C3 form rigid rods in frame C. These rods are adjusted to have approximately the same length in a static ground synchronization at station C. There are 3 high precision atomic clocks located at A, B and C.

To test each of the transmission models, a procedure would run similar to the following:

1. All equipment would be brought to the towers and calibrated with zero relative motion between the frames.

2. The planes take off, and maneuver at low speed to the alignment shown with the planes still far apart. They accelerate to the same high speed attempting to achieve a spacing whereby A1-C1 is approximately equal to B1-C3 when the aircraft cross their "ground truth" markers D5, D6, E5, E6. Distances of 1 to 100 miles would be reasonable for this spacing. Multiple distances should be tested.

3. A number of beacon flash sequences are run and the timing of pulses detected by all the sensors is collected.

4. The data is analyzed and the controversy is resolved.

The basic protocol

1. Focusing on aircraft A for this example, as the aircraft passes over fan-beam marker D5, the beam is detected by sensor A1 to initiate the setting of parameters t_0 and d_0. The detection of the fan beam initiates a light pulse from beacon A2. The pulse is detected by both sensors A1 and D1 setting a time stamp for the aircraft being at location D1.

2. Sensor A3 detects the light pulse from beacon A2. Clock A7 uses time measurements from both A1 and A3 to determine the light transit time for measured rod length A2-A3 in the moving coordinate frame A.

3. Fan beam D6 plus sensor D3 are used with sensor A1 and beacon A2 to get a second time and position measurement for the aircraft to get precise ground referenced speed measurements not dependent on electro-magnetic readings (radar or Lidar) along the axis of motion. Clock A7 also records the time of this event.

4. C1 receives the light pulse from beacon A2 and sets a time mark referenced to the "ground truth" data from D1 on clock C7. The reception of the light pulse by C1 triggers beacon C2.

5. C3 receives the original light pulse from A2 plus the new pulse from C2. For each pulse it fires beacon C4. Clock C7 captures all event times.

6. A3 will eventually receive the pulses transmitted by C2 and C4, plus two pulses from B2 on the other aircraft. These are all captured by clock A7.

7. A1 will then also receive the pulses from C2, C4 and B2 and save the times on A7.

There are a number of key elements for this arrangement:

1. The aircraft would be flown at relatively low altitude over flat terrain. The role of the fan-beam ground position markers D5 and E5 are to measure the t_0 d_0 positions of each aircraft during the test. The fan-beam markers communicate with the aircraft using a very short light path which does not need to infer time and distance measurements from reference light beam measurements that use

the same path as the speed test path. Since the distance from the aircraft beacon A2 to the ground sensor D1 would be small compared to the experimental distance A2-C1, timing error contributions are small. Also, the direction of light travel from A2 to D1 is orthogonal to the primary experimental transmission direction A2-C1, thereby not incurring either SR or Lorentz contraction; i.e. very small time transit or frame drag error would be incurred. Of course, verified time offsets would be accounted for based on known equipment delays and the calculated duration of vertical light travel.

2. The purpose of sensors A3 and B3 are to measure the light transit time for the pre-measured rod lengths A2-A3 and B2-B3 in the moving coordinate frames. **This is needed to discriminate an Aether model from SR**. Time delay differences of approximately 0.2 ns for a 200 foot spacing of A2-A3 and B2-B3 are expected.

3. The purpose of fan beams D6 and E6, plus sensors D3 and E3, are to get a second time and position measure for the aircraft to get precise ground referenced speed measurements not dependent on electro-magnetic readings (radar or Lidar) along the axis of motion. If the vertical distance becomes a problem, or the precision of the fan-beam is too low, balloon bourn sensors and beacons can be used as the ground truth point because they can be precisely located using ground based Lidar in a stationary position scheme that does not involve balloon speed considerations.

4. The purpose of sensors C1 and C3 are twofold. When C1 receives the pulse from beacon A2, it sets a time mark. Comparing this with the “ground truth“ data from D1, a **discrimination between a source model and medium model can be made.** A medium controlled transmission phenomena would produce a light speed of c. A source controlled transmission phenomena would produce a light speed of c+v. These values are not subject to square law. So for a 10 mile D1-C1 separation, with 700 mph aircraft (just below mach 1), v / c = 1.046 e-6. Portable atomic clocks are now available with precisions in the 5 e-11 range. {3} The corresponding measurements between B2 and C3 allow aether drift speed and direction to be determined.

5. C1 and C3 perform a second function. Since the same pulse from A2 will be detected first by C1, then detected by C3, the speed of the pulse between the two sensors can be measured, giving a ground referenced measure of the speed of the pulse as it passes. It's important to state that the light pulse being measured is not regenerated by another instrument. It is the same light pulse that was used by the source aircraft to make parameter measurements.

6. A3 would then receive the pulse transmitted by aircraft B. This is used to determine the transit time over the long "ground truth" distance between the aircraft.

7. A1 would then also receive the pulse from the other aircraft. As is the case for key element 5 above, this light pulse is the original pulse from the other aircraft. It is **not** a regenerated pulse. This provides two results. The first is to confirm the measurement done in step 6, with a small time correction for the A1-A3 length. But, most important, the setup would produce the data to discriminate one of the three models. By knowing the transit time of the pulse from aircraft B as it passes across the local reference frame A, the result clearly selects one of the models. If the transit speed is c, then it confirms SR. If the speed is c+va+vb, it confirms the source model. If the speed is c+va, it confirms the medium (aether) model for a medium stationary with respect to the earth surface. If the result is another value, but can be expressed using data from aircraft A and B as c+ va+vb +s and c+ va+vb –s , then it is a possible confirmation of the medium model for a medium with a drift rate s. Other results would obviously point to unanticipated models or complications like atmospheric effects.

Two discriminate the 3 transmission models, consensus and dissenting assumptions should be collected to create test hypotheses along the following lines:

1. Source model: The source determines the transmission speed. A light pulse is launched ballistically into space from the source with velocity c relative to the source. Space is empty and Newtonian. The observer is just an arbitrary ballistic object in space. Any motion of the observer does not affect the speed of the light pulse in the source or ground frames. The speed of the light pulse with respect to the

observer, that the observer measures in its own frame, is the Newtonian sum of the motion of the source, plus light speed c, minus the speed of the observer as observed by the source. The time history of transits of the light pulse past objects in the observer's universe is the Newtonian sum of the motion of the source, plus light speed c, adjusted for the locations of objects in the universe as determined by the source. (The towers of reference frame C act as transit objects.)

2. Medium model: Space is filled with some light transmitting medium. The motion of the medium is inherent to itself. A light pulse is initiated by a source through vibratory interaction with the medium or launch of a light "particle" into the medium. The light pulse travels at the speed c with respect to the medium. Any relative motion of the source or the observer, with respect to the medium, has no effect on the speed of the light pulse in the medium. The speed of the light pulse with respect to the observer, that the observer measures as it is observed, is the Newtonian sum of the light speed c, minus the speed of the observer with respect to the medium. The time history of transits of the light pulse past objects in the observers universe is the Newtonian sum of the light speed c, adjusted for the locations of objects in the universe as determined by the medium.

3. Observer (SR) model: A light pulse is initiated by a source. Space is empty. The speed at which the light pulse moves through space is indeterminate until it is observed. The speed of the source has no effect on the speed of the light pulse. The speed of the light pulse with respect to the observer when it is observed, is the speed c. To determine the time history of source initiation and transits of the light pulse past objects in the observers universe, the locations of all the objects in the observer's universe are adjusted so that the light pulse appears to have traveled from the source to the observer at the speed c relative to the observer's motion. This time transit history can be constructed by assuming a source model, making the observer the source, and running the universal clock backwards. The transit history should confirm SR contraction of ground distances and source dimensions.

15.2 Field Structure Theory

In the field magnitude discussion, the concepts physics uses for "r", the distance parameter, the "2" exponent which is generally applied in field magnitude fall-off equations, and the equivalence of both of these parameters for all field types, are questions that need significantly more research. Specific questions:

1. How is "r" measured for both a hypothetically "static" universe, and for a fully dynamic universe? Whether an SLT or SR model is assumed, the integrated time dependent field paths between objects are very complex. A key factor to resolve this is resolving the speed of gravity, which has many current challenges. {37} SLT suggests gravity adjustments are controlled by the LRR, as are all field phenomenon, and propagate at the speed "c". But cosmology, and **Newton's equations**, generally present distances to objects as measurements made using straight instantaneous "God's eye view" lines. This approach is not supported by either SLT or SR.

2. The negative "2" exponent field magnitude decay has been assumed to apply **precisely** for both gravity and electro-magnetic phenomenon. SLT challenges this for near and very far fields due to the breakdown of Lattice structure in those ranges, and for all ranges due to the LRR. Instruments now available may be able to test specific SLT predictions for field behavior.

15.3 Static Magnetic Ripple Studies

The electromagnetic charge model discussed in section 12 suggests that superconducting magnets and atomic orbiting electrons do not emit Maxwell radiation loss because the Lattice Relaxation Response produced by the inertia and elasticity of the Aas damps the far field Lattice motion. This observation suggests experiments to verify this principle by observing very low current levels. When the currents in magnetic loops approach single electrons, or low current speeds, appreciable ripple should be observable in the magnetic field. The occurrence of that ripple should generate significant electromagnetic energy loss. The result would appear as an

inability to maintain very low magnetic fields. As the current drops, a point will be reached when the energy loss increases and kills the field quickly.

16 Conclusions

The purpose of the theoretical explorations discussed in this paper were to study the implications of the four assumptions presented at the beginning of the paper. The assumptions set out new, but potentially plausible concepts for a very different fundamental foundation of the basic elements of the universe. As the studies progressed, it became apparent that the main concept, modeling matter as dislocations in a structured universal Lattice, could produce a **simple**, yet **comprehensive** set of entities and interactions which could provide both simple visualizations and functional explanations for most of the concepts of physics, including many that are still considered unanswered.

While the suggested models are yet to be empirically tested, data from prior experiments by others addressing similar issues can be used at greatly reduced cost and time. One empirical test of this type is shown in the paper showing consistency with the Space Lattice Theory model related to time contraction. The models also present new concepts to rethink the composition of fundamental elements of the universe. One of the new concepts is a model for the Grand Unification of the forces and matter in the universe. This is significant, not just because it may possibly be a true description, but because it presents a model for how the elements of a comprehensive Grand Unification concept might look.

And finally, the concepts of the study suggest empirical experiments that can be done with existing technology to settle unaddressed disagreements in the scientific community over very basic and fundamental issues.

17 Glossary and Abbreviations

17.1 Abbreviations

2-D Two dimensions
3-D Three dimensions
BHL Black Hole Lagrangian
c The classical speed of light in a vacuum
CCW Counter Clockwise
CERN the European Organization for Nuclear Research
CMB Cosmic Microwave Background
CW Clockwise
EM Electromagnetic
ESD Expanding-Shell Discontinuity
GR Einstein's General theory of Relativity
LRR Lattice Relaxation Response
LTS Lattice Twisting Structure
Mhz Mega hertz
MIT Massachusetts Institute of Technology
QM Quantum Mechanics
r Radius, usually of a spherical object measured from the center of the sphere
RF Radio frequency
SLT Space Lattice Theory
SM Standard Model
S-r Schwarzchild radius
SR Einstein's Special Theory of Relativity
SSDV Source Structure Disruption Volume

17.2 Glossary

The follow definitions are provided to clarify the specific understanding of these terms as used in this document. (#.#) after a term shows the first section in the document where a working definition of this term is provided. It may not be the first occurrence in the document.

Aa: (1.2) The Aa is a small object that is the basic constituent of the universe. The object is unique - there is only one form in the universe. The entire space Lattice is constructed of Aas and nothing but Aas. There is nothing between the Aas and no special forces such as fields exist between or within the Aas.

Action at a distance: (1.4) The occurrence of a force between two objects, either attractive or repulsive, that are separated by a void; i.e. are not in physical contact.

Antigravity: (10.5) A gravity field, which must have a source composed of antimatter, that will cause a test mass composed of Dirac matter to move away from it.

Antimatter: (10.5) In SLT, the distortion of the structure of the Lattice caused by the insertion of an extra Aa into the Lattice. Such an insertion produces negative mass and negative gravity. These inverted properties are not associated with electrical properties and do not cause negation of charge or other properties.

Antimatter Mirror: (11.6) The antimatter opposite of a Black Hole. Rather than capture conventional mass and photons, an Antimatter Mirror reflects them. The antimatter mirror, however, will capture antimatter the way a Black Hole captures conventional mass.

Bending (Lattice Bending): (2.2) A bending distortion occurs when Aas in the Lattice, viewed over a region of the Lattice, vary in position from expected positions, but the regular geometric structure of the Lattice can be traced from the far field through the displaced Aas without encountering a disruption, i.e. any loss of structure.

Big Bang: (11.1) The Big Bang Model is a broadly accepted theory for the origin and evolution of our universe. It postulates that 12 to 14 billion years ago, the portion of the universe we can see today was only a few millimeters across. It has since expanded from this hot dense state into the vast and much cooler cosmos we currently inhabit.

Black Hole Lagrangian (BHL): (11.6) A stable void at the center of a Black Hole that converts incoming photons and matter into structured Lattice.

c-Threshold Energy: (7.6) For any form of matter, the minimum pulse driving energy required for that matter to move at the speed “c”.

Captured (near field): (4.1) A property of the Lattice to encircle a void in such a way that the near field geometry of the Lattice, within a few Aa lengths distance surrounding the void, remains geometrically similar to the far field Lattice structure. (compare to Non-captured)

Coordinate system: (2.1) The coordinate system for SLT is a rectilinear, 3-D Cartesian system. Axes descriptions use the “right hand rule” and rotations are positive in the counterclockwise direction.

Dislocation: (2.2) A disruption in the Lattice in which the normal continuous repetitive structure of the far field Lattice is disrupted by a localized absence, addition or misalignment of one or a small number of Aa elements. The localized disrupted area is referred to as the near field. Directly surrounding the near field, the Lattice structure is continuous. A dislocation is a confined disruption.

Dislocation near field: (9.3) A volume of the Lattice surrounding a dislocation or a field generating collection of dislocations, within which Aa orientations are disrupted from the undisturbed Lattice structure. This volume may extend from a small to large spatial range, possibly 2 to 1000 Aa lengths. The near field does not have a specific shape. The boundary which discriminates the near field from far field is referred to as the near field transition.

Dislocation Structure: (2.2) A collection of dislocations, and particularly the stress-strain state in the Lattice caused by that specific collection of dislocations.

Disrupted Far Field: (9.3) The virtual volume of a source’s field, which once had a long-structure distortion pattern established by the passage of an ESD, but which has become “effectively” disrupted by the passage of a large number of disruptors.

Disruption: (2.2) A disruption is an uncontrolled environment that occurs when the prevailing Lattice structure breaks down and makes one or more long-structure lines discontinuous. The disruption is resolved when the Lattice pressure and inherent “self-assembly” properties of the Aas reassemble the Lattice forming continuous long-structure lines or confine the disruption within continuous long-structure lines. A dislocation is a confined disruption.

Distortion: see Lattice distortion.

Electromagnetic charge: (12.1) A new term for the source of conventional electric charge because the SLT charge structure simultaneously creates an included magnetic monopole.

Electromagnetic field noise: (9.3) The ESD energy from electromagnetic field source motion or magnitude change that is transferred into far field disrupted Lattice.

Electromagnetics: (12.1) Phenomenon referred to in physics as electrostatic and electromagnetic fields, and the behavior of electric charges and magnetic dipoles in those fields.

Energy: (2.3) Properties of matter, gravity and electromagnetic phenomenon that can be transferred between them and ultimately converted into mechanical work without changing their basic structures. In SLT, energy appears in only two forms: 1. Potential energy – which is the elastic energy of the Aas in compression as axial or radial compression or bending; and 2. Kinetic energy – which is the dynamic energy of Aas in motion due to their speed and inherent inertia.

Entropy: (5.5) A dynamic mechanical principle based on the concept of cause and effect. It explains that, for every event that disturbs the Lattice, energy will be lost to the Lattice through a diffusing process of strong, discrete, simple events creating infinitely diverse, infinitesimally small, **complex** results. In conventional physics, it is a mechanical thermodynamic principle.

Expanding-Shell Discontinuity (ESD): (5.3) The leading edge of a disturbance in the Lattice caused by some discrete event, which expands spherically in the form of a shell at the speed "c". Behind the disturbance shell, changes from the disturbance have been communicated; ahead of the shell, no information related to the disturbance is present.

Far field: (9.3) The virtual volume of a source's field, outside its particle near field, which has a long-structure distortion pattern established by the passage of the source's ESD.

Field: (9.1) In physics, a region in which a particular condition prevails, especially one in which a force or influence is effective, regardless of the presence or absence of a material medium. In SLT, a field can only exist as an arrangement pattern of the Aas.

Functional depiction: (1.1) A stylized representation of the components of an object that attempt to describe how the depicted components functionally interact with other physics elements. Only the components important for the interaction are depicted. The depiction does not attempt to present physical realism.

Fundamental Particles: (4.3) The smallest possible stable assemblies of dislocations which combine to produce all forms of matter.

Funnel-field: (12.2) Magnetic monopole field lines of an electromagnetic charge that exhibit a funnel shape. The field lines start as radially spread out lines in the electromagnetic source pancake, spiral radially inward and turn axially outward exponentially collapsing to a single line that will define an axis for the source charge.

General Theory of Relativity (GR): Einstein's General Theory of Relativity

Grand Unification: (1.3) A theory that provides a single, all-encompassing, coherent theoretical framework of physics that fully explains and links together all physical aspects of the universe

Gravitational Mass: (10.1) The strain removed from the Lattice by the reduction of strain in the Lattice due to the introduction of a Source Structure Disruption Volume.

Gravity (Gravity Field): (10.1) The mechanical shrinkage pattern in the Lattice, which is a mechanical stress-strain field in the Lattice, produced by a mass forming Source Structure Disruption Volume.

Gravity noise: (9.3) The Expanding-Shell Discontinuity energy from particle motion that is transferred into disrupted Lattice.

Great Universe: (1.1) The volume of space, considered infinite, which contains all matter and energy without limit. The term "universe", when used without qualification in this paper implies the Great Universe.

Latice: (2.1) In physics, a regular repeated three-dimensional arrangement of atoms, ions, or molecules in a metal or other crystalline solid. The use of the term “Lattice” in SLT captures the regular repetition of the Aa structure.

Lattice Distortion: (2.2) A change in the shape or scale of the Lattice from theoretical Pristine Lattice, but no long-structure lines are broken. All distortions in the Space Lattice can be categorized as bending.

Lattice healing: (2.1) The property of the Lattice to reform its long-structure pattern due to the self-organizing property of the Aas.

Lattice Relaxation Constant: (5.2) The speed at which a wave produced by a dislocation jump, in a “quiet” volume of space, would propagate through the Lattice determined by the LRR. This speed would equal the speed of light “c” as is conventionally measured.

Lattice Relaxation Response (LRR): (5.2)The rate limited movement of Aas that result from a disruption in the Lattice, which attempt to minimize the strain in the Lattice. The relaxation response rate is responsible for many Lattice phenomenon.

Lattice Twisting Structure (LTS): (12.1) A dislocation structure in the Lattice characterized by a twisting in the Lattice which creates the properties referred to in conventional physics as electric charge and magnetism.

Linear structure: (2.1) Field lines remain straight in the Lattice unless bent by a gravitational field or electromagnetic source other than their own source.

Long-structure: (2.1) A property of the repeating geometrical pattern of Aas whereby an element of one geometric pattern must touch a corresponding element in an adjacent pattern, which has an identical overall pattern, in such a way that a single, non-branching, non-converging path can be followed indefinitely throughout space.

Magnetic field: (12.3) A twisting distortion of the Lattice that, due to the rate of repetitive twisting, and the damping of the Lattice Relaxation Response, appears to have a “steady state” twist distortion in the far field.

Mass: (4.1) A property of matter that is quantified through measured interactions between matter and forces: e.g. gravity, mechanical interaction, chemical interaction and electromagnetic interaction.

Matter: (4.1) A general term to describe physical phenomena which occupy space and possess rest mass.

Near field: (9.3) A term which collectively applies to both the Dislocation Near Field and Particle Near Field.

Near field transition: (9.3) the virtual surface defined by the outer edge of the Aas surrounding Lattice dislocations that can be observed to break from the Lattice long-structure.

Non-captured (near field): (11.1) A large void for which the near field for any point in the void is also void. Such void spaces will have no reference to the far field Lattice. Voids of this type will have dimensions at least many Aa units across, and may have very large dimensions on cosmic scales.

Normal gravity: (10.5) A gravity field, which must have a source composed of Dirac (normal) matter, that will cause a test mass composed of Dirac matter to move toward it.

Object: (1.1) A composition of matter that can be visualized and interacted with in a mechanical sense. This definition varies from common usage which defines an object as a material thing that can be **seen** and **touched**. In SLT an Aa is referred to as an object, even though it can't be seen or interacted with due to its small size, because it is visualizable and undergoes interactions that are comparable to simple mechanical interactions.

Pancake field: (12.2) A volume of Lattice that is twisted, producing the appearance of a flattened circular pancake in the Lattice. The field lines from the twisting transmit a twisting structure radially out from the twist area to infinity with a magnitude that decreases with distance.

Particle: (4.1) A collection of one or more dislocations that move together as a unit, remain as a stable collection over time, and exhibit an identifiable set of properties related to interactions with other particles or fields. (Compare to Source Structure Disruption Volume)

Photon: (7.1) Photons are the combination of single Aa dislocations in the Lattice, that are not components of complex stable particles, and an accompanying pulse envelope.

Pictorial: (1.1) a drawing that could possibly represent the actual geometry of an object.

Prevailing Lattice: (2.1) The geometry of the universal space Lattice at any point just prior to being affected by an approaching particle or field.

Pristine Lattice: (2.1) The geometry of a universal space Lattice that would occur in a theoretically static undisturbed uniformly pressurized universe. There may be no occurrences of pristine Lattice in the universe.

Pulse: (7.1) A dynamic adjustment of Aas in the Lattice that move through the Lattice as a group like a single period wave moves across a water surface. A pulse can be generally quantified by: magnitude, velocity, width, and shape. The shape can take many forms, varying along all 3 spatial dimensions. However symmetries are constrained by the velocity vector.

Quantum: (4.1) a property of some phenomenon that only allows that property to exist in discrete units. The smallest theoretical unit is referred to as a “quantum”.

Scavenger photons: (11.3) Low energy photons, which no longer have the ability to interact with matter, can perfectly interact with SLT antimatter. The interaction results in destruction of both the photon and the antimatter particle leaving only energy.

Schwarzschild Radius: (11.6) The radius of a non-rotating sphere which contains mass m. At points within the sphere, gravity is “calculated” to be strong enough to make the escape velocity greater than the speed of light “c”. ($r_S = 2\ G\ m/c^2$)

Space: (1.2) The entirety of the great universe, as well as the smallest volumes within the universe.

Space Lattice Theory (SLT): (1.2) The collection of theoretical observations and principles which are suggested in this document by the hypothetical application of dislocation theory concepts to a universe densely filled with small objects that form a structured lattice framework.

Source Structure Disruption Volume (SSDV): (4.1) the virtual volume in the Lattice that contains a collection of dislocations that move together as a unit and remain together as a stable collection over time. Different collection arrangements produce discrete particles. The collection arrangements also produce the properties we know as mass, charge, the strong force, and weak force.

Special Theory of Relativity (SR): (1.3) Einstein's 1904 theory on electromagnetics

Standard Model: (13.2) The current theory that neutrons, and protons are composed of subatomic particles, and that there are 61 such elementary particles, is known as the Standard Model (SM).

Structured Lattice: (2.1) an organization of Aas that form a simple repeating geometrical pattern that continues in all 3 dimensions through the infinite expanse of the great universe maintaining long-structure characteristics.

Strain: (3.1) In an elastic material, the relative displacement of a point in the structure in relation to the surrounding material due to a change in the pressure field on the material surrounding that point.

Stress: (3.1) In an elastic material under pressure, the pressure at any local point.

Tensile force: (1.4) the ability of any entity A to interact with another entity B by causing a force in B that is directed toward A based on development of a tension state in entity B.

Thermal photons: see Scavenger Photons

Time: (5.1) In SLT, time has no substance or tangible existence of its own. It is a convenient mathematical tool for measuring the relative rates of interactions of matter and energy which are controlled by the Lattice Relaxation Response.

Ultraviolet threshold: (7.4) The energy of photons above which they are able to transfer mass through nuclear processes in conventional matter or to electrons.

Universe: (1.2) The volume of space, considered infinite, which contains all matter and energy without limit. The term “universe”, when used without qualification in this paper implies the Great Universe.

Visible Universe: (11.1) The volume of space we are able to observe through scientific instrumentation.

Visualizable depiction (pictorial) : (1.1) A drawing that could possibly represent the actual geometry of an object

Void: (1.4) In conventional science, a volume of space that does not contain matter. It may contain a “field”. In SLT, a void is a volume of space that does not contain **structured** Lattice. It may be as small as the interstitial space between closely packed Aas, or as vast as a galaxy. For small voids, they are totally empty. For large voids, they may contain freely floating Aas. In SLT, voids can not contain a field.

Wave: (7.1) A periodic geometric disturbance of the elements of a substance that may be propagated without net movement of the elements, in which the periodic nature is characterized by multiple repeats of a similar disturbance geometry. In SLT, the elements are the Aas in the Prevailing Lattice structure.

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19 Figures

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21 Author Background

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