# <u>Infinite Particle Physics</u>

## Chapter 1 – Quantum Effects Explained

In this chapter I explore many of the neglected "what?", "why?", and "how?" questions of quantum and particle physics from the perspective of a particulate ether. I show you ways to visualize the structures and mechanisms of gravity, mass, energy, charge, spin, momentum, forces, wave-particle duality, matter, antimatter, the structures of photons & leptons, and how to understand why energy is conserved, and why phenomena are indeterminate. In Chapter 2, I offer a *quantitative* defect-pair cluster concept of hadron particles, as a plausible alternative to QCD. Chapter 3 shows how to calculate the mass-deficit of inter-nucleon bonds, while Chapters 4 & 5 show how these paraxial and diagonal bonds produce the complex structures of large, and small nuclei, respectively. Chapter 6 explores particle decay, Chapter 7, particle creation, and Chapter 8, cosmological implications of an ether theory. Finally, in Chapter 9, I discuss my theory's value, limitations, tests, and applications.

Fortunately for this work, physicists are becoming used to a particulate space. For example, QCD needs a space filled with Higgs particles, Superstring Theories, a space filled with poly-dimensional "strings", and Cosmology, a space filled with "dark matter". But each of these disciplines requires its space to be filled with countless other fundamental particles. My approach differs markedly from these:

My underlying premise is *that <u>all</u> the phenomena of physics result from the interactions of just two fundamental particles, the opposite-charge, ion-like, elemental charge entities* (hereafter, **ECEs**) *which comprise a solid polycrystalline ether*. Or, stated more simply: *All Physics derives from the interactions of ECEs!*

You will realize that a theory based upon this premise will differ from current theories as radically as Copernicus' heliocentric theory differed from Ptolemy's. For example, we will perceive an ether's **matter** as various infinitely-extending dynamic distortions patterns centered about defects in the space lattice, rather than being infinitesimal bits of ad hoc somethings. **Energy** will be perceived as drifting, infinitely-extending lattice-density oscillations. And an ether's **fields**, rather than being streams of virtual particles, will be perceived as radial variations in the compactness and displacements of ECEs about any point in space. **Forces** result from the in-and-out lattice pulsations of matter interacting with these radial variations.

Explaining these concepts requires pedagogy vastly different from the conventional mathematical treatment. Our objective is to try to understand the *mechanisms* of physical phenomena, and this objective requires creating word-pictures and three-dimensional drawings, so that you can form *mental images* of these mechanisms. Prepare yourself for weird, fantastic ideas, whose plausibility will only gradually become apparent, as I demonstrate their ability to explain the quantum mysteries enumerated in the first paragraph. The hard evidence of my theory's validity won't appear until the second chapter. There you will find accurately scaled structures of numerous meson and baryon resonances, accompanied by mass calculations that often match experiment within ±0.01%. Also, in my third chapter, I show how my theory permits calculating the mass-deficits of simple nuclei accurate to ±0.02 MeV.

I begin, now, by laying the groundwork of my theory:

**Why Physics Needs An Ether**

1) **Because energy can't create matter out of <u>nothing</u>:** We know that impinging oppositely-directed photons can create matter in a vacuum. A plausible explanation for this is that "empty" space contains the "ingredients" of matter (ECE's) which rearrange geometrically in the presence of arrested energy to produce matter.

2) **An ether is needed because <u>emptiness</u> can't wave:** All particles manifest wave phenomena. Electromagnetic waves, & de Broglie matter waves are precisely modeled in mathematical expressions, but this begs the question of how these waves get from one place to another in total emptiness. A particulate space solves this dilemma, by providing an interactive medium in which wave phenomena can propagate.

3) **Because an ether can explain forces better than current theory:** Suppose that "empty" space is completely filled with ion-like granules, which we shall call *elementary charge entities* (**ECEs**), that arrange themselves into a polycrystalline space lattice. Being intimately related through mutual attractions and repulsions, ECEs could interact with each other in a manner which permits them to transmit *signals*, rather than being required to move bodily from the transmitting particle to the receiving particle, as current theory requires. Thus, local lattice displacements due to the formation of matter, its movement, or its releases of energy, can be transmitted uniformly in all directions as a *geometrically determined* pattern of inverse-square-decremented ECE displacements. In this three-dimensional matrix of opposite-polarity ECEs, no ECE granule needs to move more than a fraction of its diameter to transmit these signals, and an infinite number of signals from all directions of space can pass through any locality of the lattice without interference, their instantaneous amplitudes of displacements merely summing vectorily to form dynamic lattice distortion patterns in each locality of space. These patterns typically exhibit radial ECE-density asymmetries about any point in space. These ECE-density variations & ECE-charge displacements constitute an ether's *force fields.*

4) **An ether is needed to reduce the numbers of <u>fundamental</u> particles**: The current theory of particles, Quantum Chromodynamics, requires at least sixty-two fundamental particles to explain everything which has been discovered in high-energy particle experiments. There is no hope of reducing these numbers if we imagine each of these particles as lumps of something existing in a vacuum. But if we can conceive of them as various *structures* produced in the space lattice of an ether by different arrangements of ECEs, we can use creative imagination to construct all these structures (or their functional equivalents) from the two elementary particles which comprise our postulated ether.

5) **An ether is needed to explain quantum mysteries:** Concepts like gravity, charge, mass, energy, spin, indeterminacy, Pauli's exclusion principle, strangeness, associated production, etc. can be understood only as dynamic patterns — and patterns require a continuous medium, like an ether, in which to manifest themselves.

Now, let's see how my theory answers two quandaries that baffled former ether theorists:

### How Can Matter Move Through A <u>Solid</u> Space?

Matter movement through a solid space is a problem only when matter is considered to be something different from, or in addition to, space. My ether theory defines matter as a *continuously expanding dynamic distortion pattern in the space lattice* centered about a *"hovering" lattice defect* (or defect cluster). Thus, matter movement merely involves the movement of lattice defects, and this can occur step-by-step through exchanges of ECEs, much like hole-current in a semiconductor.

### Why Are Particle Properties Constant Over Time?

Because ECEs repel and attract each other, any local disturbance creates a spherical wave of ECE displacements which propagates in inverse-square fashion to infinity. Thus, an inescapable fact confronting our theory is that *phenomena can have no boundaries!* Experiments tell us that all particles are localized, yet cold logic tells us that every newly created phenomenon must spread out continuously towards infinity. How can it be, then, that a particle's properties remain precisely the same over millennia? Here is why:

When a particle is created, *the expansion of its distortion pattern is fueled by the ECE-displacement energy released by the collisions or annihilations of precursor particles.* Let us ask ourselves where this released energy resides. It is obviously not localized at the collision center, but will, rather, be distributed throughout the infinitely expanding distortion patterns of the precursor matter and energy. And, because every distortion pattern expands at an identical rate, and contains a *similar radial distribution* of mass-energy, particle decay extends over infinite time, and continues to transfer exactly the correct amount of mass-energy at each radial increment of expansion required by its replacement.

We can conclude two things from the above explanation:

1) Because the expanding periphery of a particle never needs to draw mass-energy from its interior, *its central mass-energy density is unaffected by its pattern growth.*

2) Because all ether phenomena propagate at the same rate, no experimental interrogation of a particle's *center* can ever catch up with its fleeting boundary, so *all particles appear infinite in size, from inside to outside.*

Now let us ask a fundamental question: **What properties for its ECEs should Infinite Particle Physics (hereafter IPP) adopt to explain all phenomena?** Here is what I propose:

### Defining The Characteristics Of ECEs Suitable For An IPP

**The elemental charge entities (ECEs)** comprising our proposed ether **are postulated to be the <u>only constituents</u> of the universe**; hence, their properties, or characteristics, cannot be derived from anything more fundamental, so they must be chosen by the theorist (inferred by hindsight) to allow space to engender all the phenomena of physics. Here's what works:

**ECE Properties Necessary To A Workable Ether Theory**

- ECEs are spherical, incompressible, and extremely resistant to spheroidal distortion.

- ECEs have a *diameter* approximately equal to 0.2 fermi (this dimension is obtained from the experimentally determined *charge* radius of the proton, and IPP's proposed proton structure, which will be explained in my second chapter).

- ECEs have a *"charge" of ±1/2e*, i.e. half an electron's or positron's charge.

- *Opposite-polarity ECEs attract* each other, and are nearly always in intimate, but non-adhesive, contact (i.e. ECEs are free to roll around or slide by each other without friction, or energy loss).

- *Like-polarity ECEs repel* each other, but are constrained by two things: 1) each ECE is in intimate contact with (usually) six opposite polarity ECEs, and 2) the universe is presumed to be "overfilled" with ECEs, so they have no place in which to expand.

- ECEs *differ only in the characteristic of "charge"*. All other characteristics of opposite-polarity ECEs are identical.

- ECEs have *inertia*, the evidence for which is: ECEs constitute an *interactive medium*, whose *speed of interaction* is obviously *finite*. This speed must be several times the speed of light, to permit light to propagate at light speed, as we shall see.

- ECEs must be *capable of forming a crystal lattice*, i.e. *opposite-charge* ECEs *must not annihilate* each other, even when in intimate contact. The infinite lattice of the cosmos must obviously be *poly*crystalline, rather than a single crystal. The average size of these space crystals is unknown, but experiments may reveal it.

- ECEs must be so abundant in the universe as to preclude the formation of a <u>perfect</u> simple cubic lattice (the structure of "empty" space), yet not be so abundant as to allow much formation of space in the body-centered crystal lattice state (the internal structure of black holes). Designing a creation scenario capable of producing this slightly over-filled ECE condition is daunting, but not inconceivable. A Big Bang creation is <u>inappropriate</u>, but IPP's concepts for neutrinos and photons provide plausible explanations for redshift & cosmic microwave background radiation, and its concepts for neutron creation may yield the observed hydrogen/helium ratios!

**Some Implausibilities About The Above ECE Characteristics**

Of course, what is left unsaid in this list is *how preposterous these specifications are!* What is the meaning, if any, of attributes like "charge", "attraction", "repulsion", & "inertia" when these terms are assigned to the fundamental building blocks of the cosmos? How can anything be both "ion-like" and an "incompressible sphere"? How can opposite charge things be in intimate contact, and not discharge each other? How is "repulsion" between like-polarity ECEs transmitted across the gap between them? How could entities like these arise in such abundance in the cosmos? I'm sorry, but I don't have a clue! My only excuse for thrusting these implausible concepts at you is that, quite miraculously, they work. Perhaps some day we may understand these ECEs from some sub-ether perspective. In the meantime, we tiptoe quietly ahead:

### Some Implications Of These ECE Specifications

Since the ether is postulated to be infinite in extent, these *excess numbers* of ECEs cannot result in expansion of the universe; instead the ECEs will be jammed together in a manner which will distort the lattice cells from cubic into a rhombic form occupying less volume. Our term for this density-increasing effect of excess numbers of ECEs will be **shrinkage**, since it results in each distorted lattice cube occupying less cubic volume.

### Shrinkage Is The <u>Crucial</u> Concept Of IPP

Although it will not be immediately apparent, **shrinkage is the crucial concept** of a workable ether theory. *Shrinkage produces a condition of universal lattice instability*, where no part of the ether lattice can be in complete equilibrium. Thus, *shrinkage provides the motive power for the dynamic events of our universe.* It creates the ECE-density oscillations we associate with energy and with particle motions, and it is essential to the formation of the "hovering" defects and defect clusters we associate with matter. Also, postulating a shrunken lattice, in which opposite-polarity ECEs are always in contact, explains why atoms have the same properties wherever they are observed in our universe. Finally, because every phenomenon utilizes shrinkage (every distortion pattern *shrink*s the lattice) we can assert that **shrinkage = mass-energy**, and, since universal shrinkage is inherently conserved (it is determined solely by the volume of the infinite universe compared to the number of ECEs therein), we can perceive **<u>why</u> mass-energy is conserved.**

### How Shrinkage Produces Phenomena

**Shrinkage is manifest as rhombic distortion** in the simple cubic lattice of IPP's ion-like ECEs. You will immediately see that the rotational ECE displacements creating this rhombic distortion could be stable only if they were identical throughout the entire universe. Otherwise, wherever points of greater rotations occurred, there would be unbalanced accumulations of repulsions between like-polarity ECEs, which would tend to spread into surrounding areas of lesser rotations, causing the ECEs of the first area to "unwind".

However, if ECEs have "inertia", these unwinding adjustments cannot take place instantly; rather, any unwinding will tend to produce a condition of rapid central rotation with zero central torsional misalignments (i.e. zero central shrinkage), immediately followed by winding up in the opposite direction, thereby recapitulating the initial degree of rotational misalignment and central shrinkage density. So, instead of producing equalized ECE torsional rotations throughout space, **local rotational disequilibriums** *tend to manifest themselves as countless discrete point-centered spherical lattice-density oscillations,* creating spherical shrinkage patterns.

**Lattice defects** *also cause local disequilibriums in the ether*, which propagate outwardly to infinity, so they, too, *result in point-centered, spherical shrinkage patterns.*

**Two Kinds Of Shrinkage Are Necessary To IPP**

**It is quite apparent** that a *center* of **spherical shrinkage** must remain *static* in the space lattice, whether manifest in spherical lattice-density oscillations, or in spherical distortion patterns created by lattice defects. Yet our universe is not static, but incredibly dynamic, with matter and energy whizzing about us in all directions. *What concept are we missing, that could explain this dynamicism?*

The answer is: **hemispherical shrinkage!** This is a very simple notion, but perhaps one not immediately self-evident. Its roots lie in a well-documented phenomenon in particle interactions, namely, that *total particle momentum is <u>always conserved</u>*.

**How I Arrived At The Concept Of Hemispherical Shrinkage**

I arrived at the notion of hemispherical shrinkage by analyzing a typical particle interaction from the perspective of lattice shrinkage, specifically, *the mutual annihilation of an electron with a positron, yielding a pair of oppositely-directed photons.*
Here were the analytical steps:

1) The merging of matter and antimatter "heals" the lattice, releasing a "blob" of energy at the annihilation point.

2) IPP perceives this energy as *a point-centered lattice-density oscillation*, which immediately expands toward infinity, drawing its increasing demands of spherical shrinkage from the *decaying residues of spherical shrinkage implicit in the collapsing distortion patterns* of an infinite series of precursor phenomena.

3) However, *there is always a complication in annihilations:* Being oppositely charged, the annihilating particles accelerate towards each other, thereby each gaining increasing components of momentum from the mutual cancellation of each other's charge fields. Although I did not yet understand what momentum *was* in an ether, it was clear that the annihilation shrinkage *could not be strictly spherical*, but it would, rather, have some form of *"momentum protrusion"*, due to fact that the *absolute* momentum of the two annihilating particles could never be *precisely equivalent.*

4) Clearly this *non-spherical component* of shrinkage was inappropriate for a *spherical* lattice-density oscillation. A spherical LD oscillator couldn't utilize this "momentum protrusion"; hence, this protrusion would be required to spawn some *other* phenomenon.

5) Since this annihilation shrinkage would tend toward an ellipsoidal shape, I wondered if, perhaps, *an ellipsoidal lattice-density oscillation* would form, instead of a spherical one. But this idea had a severe problem: an *ellipsoidal* oscillation could be sustained only as a *moving* phenomenon, which meant that synchronous *moving shrinkage* would be required to sustain it. And a *centered* ellipsoidal oscillation was a contradiction, because it obviously couldn't move in *both* directions without splitting itself apart!

6) At this point, the solution became obvious: *The distorted shrinkage must <u>split progressively into two hemispherical parts</u>, and spawn <u>two</u> ellipsoidal ECE-density*

*oscillations, each moving away from the other in opposite directions!* And, since the end products of our scenario, above, are two photons, **these ellipsoidal ECE-density oscillations** (hereafter lattice-density oscillations, or LD oscillations) **must represent the phenomenon of a photon.**

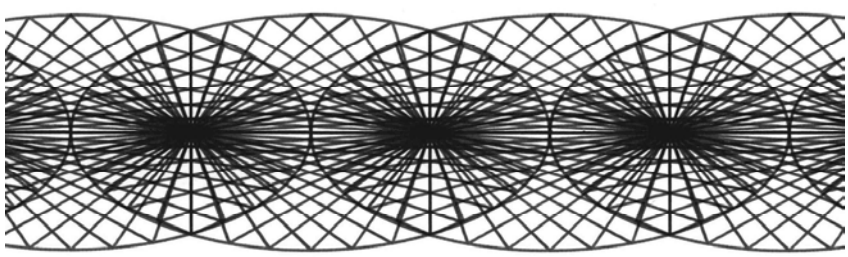
This imagined scenario was thus the origin of the notion, "**hemispherical shrinkage = ellipsoidal LD oscillation = photon = radiant energy**". Now, let's dig deeper into our new concept for a photon, and the nature of the hemispherical shrinkage by which its ellipsoidal oscillation is nourished:

### The IPP Concept Of A Photon's Structure

**A Photon** is a **soliton** in IPP, but of a unique structure. It is a continuously expanding ellipsoidal LD oscillation, whose central ECE density waxes and wanes periodically, and whose aspect ratio (the major to minor diameter ratio of its first node) forces its period of maximum central density to step through the lattice at the speed of light. Its maximum central ECE density (its energy) determines the *frequency* of its ellipsoidal lattice-density oscillations, which, in turn, determines its *step distance* (wavelength*). Photons are produced either as oppositely-directed pairs, or singly, with an equal, and opposite, component of momentum attaching to ambient particles. Very rarely, more complex scenarios ensue. However, in every case, they are produced by the process given in the next paragraph:

* Since we know that a photon's wavelength scales inversely with its energy, we deduce that the size of a lattice-density oscillator's first node must scale inversely with its frequency. I will explain why, later, when I describe the *structure* of an LD oscillator.

**Fig. 1-1 Cross-Section of a Moving Photon's First Nodes**



### How Photons Are Formed

**Photons are formed** as an artifact of the progressive bisection (from its center outwardly) of a point-centered zone of (nearly) spherical shrinkage. One can also say that the splitting of spherical shrinkage occurs because it has spawned two oppositely-directed, and unceasingly-expanding ellipsoidal lattice-density oscillations, each moving away from the center of spherical shrinkage at the speed of light. So, we must perceive that progressively-expanding hemispherical shrinkage and photons are *inextricably linked* — each produces the other. Because of this linkage, we can infer that the moving centers of both phenomena must always "track" each other, and must have identical mass-energy.

Thus, a photon develops with its ellipsoidal LD oscillator shrinkage centered in the *moving center of mass-energy* of an expanding zone of *hemispherical* shrinkage, and, hence, must adjust its degree of ellipticity so as to move at this same speed. Because the rate of bisection of spherical shrinkage is a fundamental property of the space lattice, all zones of hemispherical shrinkage, regardless of their mass-energy density, expand at the same rate; *hence, all photons, regardless of their energy, step through space at same speed, c.* Also, since the *periphery* of hemispherical shrinkage inherently *expands at several times the speed of its center of mass-energy* (i.e. its center of shrinkage*), we perceive **that lattice-density signals must propagate at several times the speed of light**.

* Because point-centered shrinkage scales as $1/r^2$, we should see that the moving *center of mass-energy* of an expanding hemisphere of shrinkage lies closer to its center of curvature than does the center-of-mass of a solid hemisphere (3r/8).

**IPP's Photon Structure Explains Quantum Enigmas**

**This photon structure,** along with its creation scenario, **has great power to illuminate many photon mysteries:**

- Its structure shows us why *a photon is both particle and wave* (it is both point-centered *and* an ever-expanding oscillation).

- The fact that its lattice-density waves *propagate in and out at <u>several times</u> the speed of light* explains why *its center can step along <u>at</u> the speed of light.*

- Because they derive from a *splitting* process, we can understand *why pairs of photons head in opposite directions.*

- Because of its effectively infinite size and because its mass-energy (shrinkage) is distributed in equal radial increments to infinity*, we can understand *why a photon's center can pass through one pinhole, while its distortion pattern can go through an adjacent pinhole at the same time, and even through the metal (with delay) that the holes are punched through.* This readily explains how a photon can *interfere with itself!*

  * This is because ECE displacements = shrinkage = mass-energy, and because ECE *displacements* of point-centered distortion patterns scale as $1/r^2$, while the *numbers* of displaced ECEs scale as $r^2$.

- Being a diffuse & ever-expanding oscillation, a photon can take both paths through partially-reflecting mirrors, or pass around both sides of a distant galaxy. These attributes also give *a photon homeostasis*, allowing it to recover from transient interactions of its center with other phenomena; thus, it maintains a linear trajectory.

- Because point-centered LD oscillations require rotations of opposite-polarity ECEs at their centers, and these rotations influence the entire oscillatory structure, *photons exhibit polarization.*

- Because pairs of photons derive from an unceasing shrinkage-splitting process, and because their LD oscillations propagate at several times light speed, we can understand *why created pairs of photons maintain correlated polarizations as they separate.*

- Because they *lack hovering defects* at their centers, *photons do not have spin.*

**We Pause To Define A Few Of IPP's Terms**

It is inevitable that many physical terms in common use will come to have new interpretations in IPP. Here are some examples:

**energy:** A point-centered oscillation in the density of ECEs; usually referred to as a lattice-density (or LD) oscillation.

**particle rest mass:** The "static", or spherical shrinkage component of a particle's hovering LD oscillator.

**particle mass-energy ($mc^2$):** The total shrinkage captured by the particle's defect(s) and its(their) hovering oscillator(s).

**matter:** An ever-expanding *dynamic* lattice distortion pattern, centered on a hovering, drifting lattice defect, or defect cluster.

**anti-matter:** Precisely the same distortion pattern as its matter equivalent, *except* that corresponding ECEs in this infinite pattern are of *opposite* polarity.

**leptons:** Particles whose core defects are *uncollapsed* voids, out-of-place ECEs, or excess ECEs.

**hadrons:** Particles whose core defects are *collapsed* voids (c-voids), joined together in pairs of opposite expansion/contraction orientation. Paired c-voids have *quantized* defect spacings, which vary from 5 → 15 lattice units, and which scale with cluster size and complexity. C-void defect-pairs cluster together in various numbers from 1 → 16 to form the hundreds of known meson and baryon resonances.

**particle creation:** The production of defects by rotation of ECEs past a "toggle" point at the center of a vigorous LD oscillation.

**annihilation:** "Healing" the lattice of defects in the interaction zone by rotational exchanges of opposite-polarity ECEs.

**What Sets The Magnitude Of "Captured" Shrinkage?**

The minute amount of primordial shrinkage captured by each of these lattice-density oscillations, whether ellipsoidal, or spherical, will be in proportion to the maximum angle of torsional rotations manifest by their central ECEs, which, it would seem, can take any value (although more central ECEs will undoubtedly need to rotate to produce the high central densities associated with very high energy photons). This *lack of discrete quantized values* of oscillatory shrinkage *is consistent with* our notions of *both radiant and kinetic energy,* **but** this variability *is inconsistent with* our concept of *mass*, which we have identified as the *spherical* component of the LD oscillations effecting a defect's *hovering.* Let's explore this puzzle:

**Why Hovering Shrinkage Is Quantized In A Non-Drifting Defect**

The spherical shrinkage component of a defect's hovering oscillator is quantized, because the energy of a non-drifting hovering oscillator is *precisely* the amount required to cause a defect to hover back and forth incessantly between two *adjacent* lattice locations. If there were *less* shrinkage than this quantized amount, the defect could not have formed (since ECE rotation is implicit in defect formation); if there were *more* shrinkage, the excess shrinkage would have bisected into two zones of hemispherical shrinkage, one of which would have attached to the hovering oscillator, causing it to drift. IPP's term for this quantized spherical shrinkage component of a hovering oscillator is: **mass shrinkage.**

**Defect-Bound Shrinkage — The Other Quantized Component**

**When a lattice defect forms**, as a result of annihilation-released spherical shrinkage, it creates local lattice asymmetry and local charge disparity. Both of these disturbances *alter* the balance between attraction and repulsion of the ECEs in its vicinity, causing these ECEs to seek new equilibrium locations in the space lattice. These local deviations from orthogonality create higher local ECE densities, and progressive waves of disequilibrium, which are coupled from ECE to ECE outwardly, forming a lattice distortion pattern of shrunken space, which lessens in inverse-square fashion toward infinity. Since these displacements are purely geometric responses unique to each defect's characteristics, we can conclude that each defect type captures a *quantized amount* of lattice shrinkage in its infinite distortion pattern. IPP terms this defect-induced *component* of a particle's total shrinkage, **geometric shrinkage**.

Thus, we see that a hovering defect, when in a non-drifting state in absolute space, has just two components of mass-energy, **geometric** shrinkage, required by defect's "static" distortion pattern, and **mass** shrinkage, required by a non-drifting defect's hovering LD oscillator. Both shrinkages are *quantized.* This conclusion that non-drifting hovering defects bind *quantized* amounts of primordial shrinkage leads us *to identify hovering defects as* **matter**.

**Why A Particle's Mass-Energy Greatly Exceeds Its Mass**

The total sum of shrinkage released when a particle is annihilated (its mass-energy, $mc^2$) greatly exceeds the *mass shrinkage* (i.e. that due to its mass, m). What appears to be true is that the *geometric shrinkage* utilized in forming a defect's geometric displacement pattern moves freely through space at no energy cost, except for a minute amount implicated in a particle's spin (more about this later). Or, if we put this assertion in more conventional terms, *the entire inertial mass of a particle seems to reside in the mass shrinkage component of its bound hovering LD oscillator.* Here is why this could be true:

- When a particle is viewed as an infinite pattern whose mass-energy is distributed in equal radial increments to infinity, moving its *center* back and forth may require moving only infinitesimal amounts of shrinkage.

- There could be a <u>*continuous*</u> *interchange of spherical shrinkage* between a <u>drifting</u> particle's geometric displacement patterns and those of all other phenomena in the universe. This interchange could result from local changes in the integrated amounts of rhombic distortion & ECE ellipticities, as these universal mass/charge fields interact dynamically with the moving defect's mass/charge field. And the *effect* of these changes in lattice distortion could be to cause a defect's *center* of geometric shrinkage *to move with the defect,* while an equal amount of *universal* geometric shrinkage moves at precisely the same rate in precisely the opposite direction. If we accept these arguments, we perceive that *spherical shrinkage may never change its distribution in space.* Only hemi-spherical shrinkage moves, but, even here, its movement is precisely offset by an equal and opposite movement of its split counterpart. These *inherent offsetting effects* of moving centers of shrinkage explain, rather neatly, **why angular momentum is conserved.**

### Why Defects And Hovering Oscillators Are Locked Together

A defect creates a charge imbalance in the lattice that couples from ECE to ECE to create a charge field, which stretches toward infinity. This charge field tends to repel an LD oscillator when its center is displaced from the charge-field center **—** *but*, the oscillator also tends to rotate ECEs at its center during its maximum central density phase, and *this* is the action required to displace the defect to an adjacent site in the lattice. Therefore, the repelling action is negated by the tendency of the oscillator to rotate the defect to the opposite side of its center, thereby reversing the direction of its field's repulsion. The result is negative feedback locking defect and oscillator together, leading to a stable back-and-forth motion at half the LD oscillator's frequency.

### IPP's Concept For Particle Motion - Ellipsoidal Hovering

Because a defect's hovering lattice-density oscillation pulsates in-and-out, it is affected by radial lattice "stiffness" irregularities in the defect's vicinity *(IPP's idea of **fields**)*. This interaction alters the oscillator's ellipticity, thereby altering its rate of drift through the space lattice. This change in drift inevitably alters the rate at which the defect progresses through space, since a defect must continually hover between the two defect sites closest to the hovering oscillator's center. It will be worth our while to dig deeply into these matters, because our investigation will unveil the nature of spin, forces, accelerations, momentum, and de Broglie matter waves. We begin by looking into the dynamics of an idealized lattice-density oscillator:

### An Idealized Lattice-Density Oscillator

### Some Primary Considerations

In any lattice of mass points coupled by suitable restoring forces, there will be a characteristic speed of propagation for mechanical displacement signals. In the space lattice, this speed of propagation is determined by the "inertia" of ECEs in relation to the strengths of their mutual attractions and repulsions. This speed of propagation, despite Einstein's assertion, must be several times the speed of light, as I have argued in the preceding photon discussion.

Following the usual custom in analyzing an oscillation, we shall defer explaining its origin, and merely assume that a lattice-density oscillator exists. Our immediate goal is to describe its structure.

**The Structure Of A Lattice-Density Oscillator's Center**

Let us assume that somewhere in the space lattice a point-centered zone of shrinkage has caused two central opposite-polarity ECEs to rotate around their mutual center until their rotation has been brought to a halt by the accumulated repulsion of like-polarity ECEs in this more condensed environment. At this moment, the central shrinkage is at a maximum, with all local motion arrested, and with all local mass-energy in the form of torsional stress. What immediately follows, of course, is that this accumulated repulsion acts on these fully "wound-up" ECEs to cause them to unwind toward a local condition of an undistorted lattice, at which point, the two opposite-polarity ECEs are rotating at a maximum angular speed, the central mass-energy of the oscillator is in the form of rotational, or angular, "momentum"*, and the central shrinkage is zero.

* I use quote marks because ECE "momentum" implies ECE "inertia", which is another unexplained postulate of the Theory. You will also perceive that every part of the oscillator's structure governs every other part. Assigning a dominant role to the oscillator's center is purely a pedagogical device to aid comprehension.

Where did the central shrinkage go during this conversion to ECE "momentum"? Since shrinkage is conserved, it clearly must have moved outwardly, probably in a spherical front. Yet, we see that the shrinkage must return again to the center, because the angular "momentum" of the two central opposite-polarity ECEs will cause them to "wind up" in the opposite direction. Having postulated that ECE interactions are lossless, we can be assured that this opposite rotation will halt at the same angle of rotation as the previous rotation, producing the identical amount of central shrinkage. However, although the shrinkage is identical, the pattern of ECE displacements is not! It is, instead, *a mirror-image pattern with all the ECE polarities reversed*. I have italicized this notion of pattern and ECE polarity reversals, because it is essential in explaining the hovering motion of defects, spin, polarization, charge-exchanges, and many other things.

**What Happens In The Space Surrounding The Oscillator Center?**

As the two central ECEs rotate back and forth, this movement couples to their immediate ECE neighbors, and through these to surrounding ECEs, etc. toward infinity. However, because of the postulated ECE "inertia", the mechanical inertia of each spherical shell increases as the square of its radius, so that the coupling of outward displacements from one spherical shell to the next is progressively delayed, causing two things to happen:

1) ECEs of each inner shell "overshoot" those of the next outer shell — that is, they rotate further around than they would if the coupling between shells were instantaneous.

2) These "overshoots" introduce torsional stresses in each successive spherical shell of the oscillator, causing each to store, momentarily, a portion of the shrinkage emanating from the oscillator center. These overshoots, in turn, cause each shell to become an additional signal source radiating signals both

outwardly and inwardly as they unwind. This manner of energy storage and re-emission, shell by shell, has several profound consequences. The first is:

**An Oscillator Frequency Is Proportional To Its Shrinkage**

This argument is complex, but is easy to follow:

1) The angular rotation of the oscillator center is proportional to central shrinkage.

2) The central torsional stress is proportional to the angle of rotation.

3) The rate of change of central rotation (the signal) is proportional to the torsional stress.

4) The percent of signal overshoot, shell by shell, is proportional to the rate of change of the signal, shell by shell.

5) The fraction of shrinkage stored, shell by shell, is proportional to the percent of signal overshoot, shell by shell.

6) The number of shells required to store the central shrinkage is inversely proportional to the fraction of shrinkage stored/shell.

7) The frequency of the oscillator is inversely proportional to the number of shells required to store and return the central shrinkage, and therefore is proportional to the central shrinkage.

8) Hence, here is a rationale for Einstein's insight into the nature of a photon, whereby E = hf, although, of course, a photon is a moving lattice-density oscillator, not a static one.

**In-Out Signal Velocities Vary With Radius**

We have surmised that "overshoots" cause each spherical shell of the oscillator to store shrinkage, and return a portion of this stored shrinkage back toward the oscillator center. These return signals, however, travel faster than the outgoing signals, because the "inertia" of each shell *decreases* inwardly. We can infer that inward and outward propagation speeds will differ dramatically near the oscillator center, because of substantial differences between inward and outward "inertia", but these speeds will be very nearly equal remote from the center, because the two "inertias" are very nearly equal. However, the round-trip time from the oscillator center to any shell will be strictly proportional to its radial distance, because the slower propagation times of outgoing ECE-density signals close-in will be compensated by the faster return times.

**An LD Oscillator Develops Signal Nodes**

The fact that a lattice-density oscillator develops both outwardly and inwardly moving signals in each spherical shell leads to differing phase relationships of these opposing lattice-density signals. At some radial distances, they will be out-of-phase, and will cancel; at other distances, they will be in-phase, and add. These nodes will, of course, shift in and out in synchronism with the central lattice-density oscillations, so we should visualize the oscillator density patterns as an endless series of concentric spherical shells, each supporting a lattice-density "wave", which moves back and forth within this narrow zone. These waves change their electric polarization on successive oscillator cycles, as I explain next:

**An LD Oscillator Produces An Alternating Charge Field**

You will perceive that the two central opposite-polarity ECEs reverse their directions of rotation at each central ECE-density maximum. Since these rotating ECEs influence surrounding ECEs by repelling ECEs of like polarity in their vicinity, these central repulsions will propagate outwardly in inverse-square fashion, in synchronism with the density wave. This influence will naturally be strongest along the line connecting the two rotating ECEs, and will diminish to zero in all direction through the oscillator center perpendicular to this line, where the opposite-polarity influences cancel. Since these repulsions vary with the central angle of rotation, the resulting outward wave of ECE displacements will have a sinusoidal character, which reverses polarity each time the two central ECEs pass through the zero shrinkage (and maximum angular "momentum") phase of the oscillator cycle.

Thus, a lattice-density oscillator generates an alternating charge field, whose frequency is *half* its own frequency, whose amplitude is proportion to the oscillator frequency (or energy), and whose maximum amplitudes tend to lie in one of the six face-diagonal planes of the space lattice. We should notice, also, that the two hemispheres of this alternating electric field have opposite instantaneous polarities in opposing radial directions at the same radial distances from the oscillator center.

**Why An Oscillator's Polarization Maintains A Constant Direction**

If central ECE rotations must always take face-diagonal directions, how do they maintain a fixed direction in space during the changing ambient conditions that a drifting oscillator encounters? What happens when the oscillator center encounters local lattice asymmetries, transient proximity of charged particles, or periodic angular shifts in the cardinal axes of the space lattice resulting from passing through successive grain boundaries? The answer: the oscillator's stability of polarization depends upon its *huge* size, and the fact that all of its parts are in intimate feedback relationships. When grain-boundary transits cause shifts in cardinal lattice directions, the outer parts of the oscillator's distortion pattern force the central rotations to spread over several lattice cubes, with multiple diagonal-plane orientations, so that their integrated motion has essentially the same direction of rotation. Directional changes in oscillator polarization *can* occur, but these require persistent influences. Most transient interactions involve successive influences which are equal and opposite, and integrate to no net effect.

So we see that *a lattice-density oscillator has homeostasis,* as it generates its very complex pattern of dynamic displacements in the surrounding space. Will these complex oscillator attributes have observable effects? To explore this question, we will need to move our idealized lattice-density oscillator into the real world.

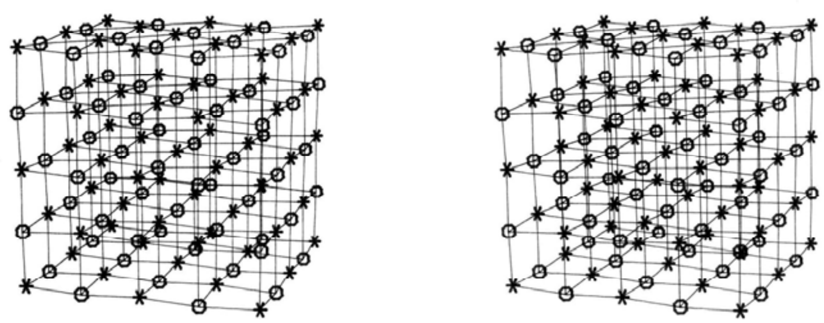
## The Lattice-Density Oscillator In The Real World

### The Effects Of Local Lattice Asymmetry (Forces)

In the real world, the space surrounding a lattice-density oscillator is not pristine, but is, rather, a summation pattern of all the inverse-square-attenuated dynamic distortion patterns of all the communicating matter and energy in the universe. With very few exceptions, this summation pattern will exhibit asymmetry relative to an LD oscillator center. Although this asymmetry is always dynamic, it will usually exhibit two kinds of "static" biases:

1) **A charge-field bias**: The charge field is manifest as time-averaged, oppositely-directed torsional displacements of plus ECEs and minus ECEs from their "normal" equilibrium locations (i.e. the locations opposite-polarity ECEs would assume in an undistorted cubic lattice). This charge field is easiest to visualize as an abstraction. Let us imagine, for example, that we have stopped an electron from hovering, and placed it four lattice units above a 4x4x4 section of the space lattice. Under these idealized conditions, in Fig. 1-2, below, we see face-diagonal lines of +ECEs raised slightly above their "normal" locations, and face-diagonal lines of -ECEs slightly below their normal locations:

   **Fig. 1-2 An Electron's Charge Field**

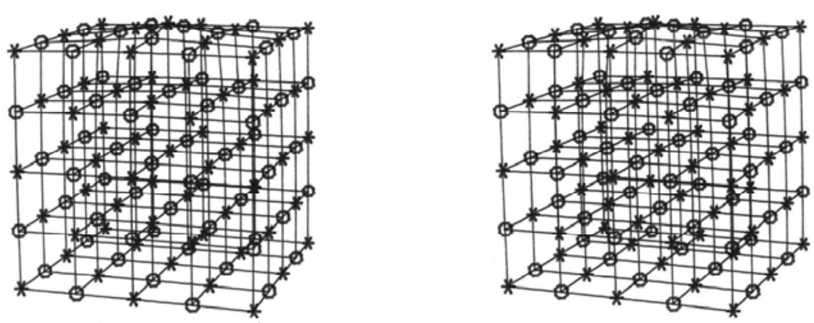
   These displacements will increase gradually in the direction of the field-producing defect, and decrease gradually in the opposite direction. These changes in the magnitude of the displacements are the charge field gradient. Its field vector would point in the direction of the most rapid increase in these displacements, and will have a magnitude proportional to the rate-of-change with distance of these displacement magnitudes.

2) **A mass-energy-field bias (gravity)**: Gravity is manifest as an infinitesimal ellipsoidal distortion in the time-averaged <u>shape</u> of ECEs. These shape changes are a consequence of a pattern of variations in local ECE densities which result from the vector summation, moment-by-moment, of all the dynamic lattice distortion patterns passing through each lattice location. Since these lattice-perturbing patterns are typically large relative to the size of a lattice "cube", the time-averaged ellipticity of ECEs will vary systematically from place to place. These variations constitute a gravitational field. The strength of the

gravitational field at any point in space is proportional to the rate-of-change with distance of these ECE ellipticities, while its vector points in the direction in which the ECE ellipticities are increasing most rapidly.

We can think of these time-averaged ECE shape-changes as elongating each ECE in one direction, while contracting it in all orthogonal directions. I show the lattice distortion produced by a hypothetical point-centered neutral particle just one lattice unit above this 4x4x4 section of the space lattice in Fig. 1-3, below.

**Fig. 1-3 Gravitational Field (Greatly Exaggerated)**



You will perceive, above, that the source shrinking the lattice must be extremely close-by, and its magnitude of influence must be extremely exaggerated, for these differences to be noticeable. The reason for this imperceptibility is that longitudinal elongations and orthogonal contraction of ECEs do not lead to torsional displacements, so they must work against the extreme cardinal rigidity of the space lattice, i.e. the rigidity of the ECEs, themselves. This is our dominant clue to the extreme weakness of a gravitational field compared to a charge field.

To perceive the effects of a gravitational field, we will need to explore how these exceedingly minute ECE time-averaged shape-changes alter the lattice "stiffness" in various radial directions to the in-and-out lattice-density waves of a hovering oscillator. We shall develop this understanding in the next few pages.

### A Few More Details About IPP's Force Fields

IPP needs explanations for only four force fields — charge, mass-energy (gravity), magnetic, and strong-force. The so-called weak-force plays no part in IPP, which offers other explanations for particle creations, interactions, and decays. We shall deal, here, only with the charge & mass-energy fields, because the magnetic & strong-force fields require prior understanding of defect-pairs.

It is important to perceive all IPP's force fields as *integrated biases* of lattice distortion patterns, because these fields are, themselves, dynamic, and are all buried as sub-components in a composite dynamic distortion pattern of infinite complexity. You will perceive that this is true, since every point in the infinite space lattice is the recipient of inverse-square attenuated dynamic distortion patterns from every communicating bit of matter *and* energy in the universe. So when I describe the *structure* of a particular force field, you will understand that this structure is its *affective* pattern, rather than its actual shape.

We will need one other important insight to understand how these diffuse and ever-changing force fields interact with a defect's hovering LD oscillator. It is this: The *in-and-out pulsating characteristic* of a hovering oscillator's point-centered lattice density waves permits them to sample the lattice irregularities, or asymmetries, *of a substantial volume* of the surrounding space. These asymmetries produce varying lattice "stiffnesses" in different radial directions to the out-going lattice-density waves, which result in varying return times & energies from different radial directions for the reflected waves converging on the oscillator's center. The net result is to alter the oscillator's ellipticity, which can change both the rate and directions of the drift of the oscillator's center, along with its hovering defect. Although each of the four force fields alters the lattice stiffness in a different manner, the hovering oscillator is oblivious to these differences. It simply responds to the integrated effect of all four force fields as a superimposed mixture. There will, of course, be one other significant effect of this scenario ─ the fields, themselves, will be altered by this interaction. I will explain this as we proceed.

### We Pause To Develop A Mental Image Of An LD Oscillator Field

Let us think of the changing ECE patterns developed by an LD oscillator in terms of concentric shells of plus ECEs and minus ECEs. Viewed from any point in *empty* space, these opposite-polarity concentric shells would alternate with equal spacings to infinity. Now imagine this same point as the *center of an LD oscillation*. The concentric charge shells will be subject to these changes:

1) Their average diameters will contract inverse to the square of their radial distances, and by an amount proportional to the primordial shrinkage captured by the LD oscillator.

2) Each shell will be expanding and contracting in synchronism with the central oscillator rotational frequency, appropriate to its radial and phase distance from the oscillator center.

3) The *centers* of these charge shells will oscillate sinusoidally back and forth in some arbitrary direction through the oscillator center, at half the LD oscillator frequency, with an amplitude proportional to the oscillator's energy. The centers of opposite-polarity shells will move always in opposite radial directions, with their shell movements scaled inverse to the square of their radial distances, and timed appropriate to their phase distance from the oscillator center. These back and forth shifts, of course, determine the direction and the amplitude of the oscillator's alternating charge field.

### How An External Charge Field Affects An L-D Oscillator

In order to understand the effect of an external charge field on an LD oscillator, we will ignore all the external field's hovering complexities, and consider, rather, its "static", or *integrated* charge-displacement pattern. We can visualize this field as successive spherical shells of ECEs, either expanded, or contracted, depending upon their polarity. Let us now imagine that we are so far from external defects producing this charge field, that these consecutive shells are indistinguishable from parallel planes. We now need a slightly different mental image. Let's consider that the charge field is manifest as a continuum of *pre-rotated* ECE dipoles, each of which tilts its attracted end toward the remote defect, thereby generating a torsional stress in lattice.

These dipole rotational *stress biases* cause the amount of overshoot at various radial directions and distances to differ on alternate cycles (opposite-polarity cycles) of the LD oscillator, because the lattice is "stiffer" for one direction of dipole rotation (in the pre-rotated direction) compared to the other. These overshoots will exhibit their maximum differences when the oscillator's alternating-field vector lines up with the charge field vector; opposite-polarity cycles will exhibit minimum differences when the two vectors are orthogonal. And, regardless of the angle between the oscillator alternating-field vector and the charge field vector, the overshoot *differences* will vary in different radial directions from the oscillator center, being a maximum in the oscillator's alternating-charge-field direction, and zero in orthogonal directions.

**What effects will these overshoot differences have** on the lattice-density oscillator? There are three dominant effects:

1) **The reflected signals** returning to the oscillator center *will no longer be in sync from all radial directions*; those returning from the direction of the charge field vector, or opposite to this direction, will arrive sooner than orthogonal signals during one LD oscillator cycle, and will arrive later during the succeeding cycle. These timing differences will tend to shift the direction of the oscillator central +ECE/-ECE dipole rotations on alternate cycles, first *with* the charge field, next *orthogonal* to the field. But, because of ECE "inertia", what will happen is that the direction of rotation will tend to shift midway between these two extremes.

2) **A second effect** is more subtle, and results from the charge field *gradient*. Oscillator signals will *return both faster <u>and</u> slower* from the direction of the charge field gradient, than from the direction opposite to this gradient. Since the faster returning signals have more influence on the oscillator center than the slower signals, the result of this signal timing difference will be to shift the oscillator center continually in a direction *opposite* to the charge field gradient.

3) **The third effect** is for a charge field *to increase the oscillator frequency*. Since the oscillator return signals orthogonal to the charge field tend to be unaffected by the field, and whereas the signals in the field direction are both speeded up and slowed down, we see that the speed of the central rotations will be governed by the orthogonal signals during the slow return part of the field-direction signals, but will be governed by the field-direction signals during the fast-return part of the cycle. The result is a central rotation frequency which is intermediate between the unaffected value and the fast-return value.

### Why The Interaction Produces Hemispherical Shrinkage

Thus, we see that a spherically symmetric lattice-density oscillator, if suddenly immersed (this is hypothetical, of course) in a charge field, will steal mass-energy (shrinkage) from the field, increasing the oscillator energy, i.e. its frequency. These changes in the oscillator's structure will start a lattice-density wave of changes in the charge field which will ultimately result in changing the ellipticities of all the hovering oscillators of all the particles whose patterns contribute to the field. The ellipticity of these field-producing oscillators will be altered so as to produce an infinitesimal change in their momentum, whose integrated value is precisely equal and opposite to our oscillator's momentum change. It is the opposite motion of these two effects which permits us to interpret the interaction of an oscillator with an ambient charge field as stealing a component of the field's spherical shrinkage, which instantly *splits* into two oppositely-directed hemispherical components.

Of course, once an LD oscillator finds itself in a charge field, it tends to move its center *opposite* to the field's gradient, thereby gradually losing its stolen energy back to the field.

### How A Gravitational Field Affects An L-D Oscillator

**Since shrinkage affects both polarities of ECEs equally,** it will produce no torsional displacement effects, as we see manifest in the charge field of Fig. 1-2. Thus, *opposite-polarity* signals moving out from the oscillator center will exhibit *equal delays* in their return signals from any radial direction. There will, of course, be minute differences in the return *times* of both polarity signals compared to a field-free region of the space lattice, because shrinkage implies a higher local density of ECEs. A shrunk lattice will be stiffer toward torsional displacements than "empty" space, producing more over-shoot, and, hence, quicker return times. We can see, therefore, that one result of a gravitational field will be to increase the frequency of any LD oscillator suddenly immersed in it. There is experimental evidence for this changing oscillator frequency with variations of gravitational field intensity in the Mössbauer Effect, and in gravita-tional redshift, for light emerging from massive stellar bodies.

**But why does a gravitational field gradient <u>attract</u> an LD oscillator,** rather than repel it (the experimental evidence being the bending of light rays in the direction of higher gravitational field intensity)? To find out, we must discover just how the over-shoots vary for LD oscillator signals moving in-and-out at different angles relative to the longitudinal stretch and orthogonal compression of a gravitational field. A way to get an intellectual toehold on this problem is to think of the gravitational field as a multiplicity of ECE dipoles, whose dipole moments vary in different directions relative to the gravitational field vector, because both the center-to-center spacings between opposite-polarity ECEs, and the spacings between like-polarity ECEs, vary in these different directions.

Let us assume, for the sake of simplicity, that the lattice surrounding the oscillator center consists of concentric shells of opposite-polarity ECE dipoles, all oriented so as to be *normal* to the shell's radius. Now, if we imagine the oscillator to be immersed in a gravitational field, here is the situation: Looking in the field direction, we see dipoles with shorter center-to-center spacings, but with increasing spacings between shells (see Fig. 1-3). Looking normal to the field, we see these two attributes reversed. Thus, in the field direction, we find dipoles with a shorter lever arm (more force required to rotate), but with weaker ambient repulsion (less hindrance to rotation); in the direction normal to the field, everything is reversed. The result: a stand-off — we conclude that the dynamic stiffness in either direction is almost identical. Here is another reason for the extreme weakness of the gravitational force.

**The fact that there <u>is</u> a gravitational force** tells us that there is *some* very slight inequality between the two dipole rotating situations. Wouldn't we expect the postulated "external pressure" to make it somewhat easier to elongate ECEs toward a center of radial shrinkage, than to shorten their center-to-center spacings through circumferential compression? Wouldn't this disparity slightly ease the stiffness to dipole rotation in the field direction, so that overshoots at the same radial distance from the oscillator center would be infinitesimally less, than orthogonal to it?

Hence, since lattice-density signals encounter the easiest dipole rotation (least "stiffness") in the increasing ECE stretch direction, they will return latest from this direction. And, of course, this timing disparity will cause the oscillator center to move in the direction of the gravitational gradient. Here is the explanation for Einstein's prediction of light deflection by our sun, and for the subsequent astronomical discovery of a gravitational lens effect, when light from a very distant galaxy is presumed to be bent inwardly as it grazes both sides of an intermediate galaxy.

**How A Hovering Oscillator Responds To An Electrostatic Field**

We notice, first, that the presence of a replacement defect at the hovering oscillator's center creates a spherically symmetrical charge field of much greater strength than any possible ambient field due to external charged particles. Thus, to determine how an external field changes the direction and speed of drift of a *hovering* oscillator, we need to perceive that the bound hovering oscillator responds to the *algebraic sum* of its internal hovering defect's field and its external fields. We know that a hovering oscillator accelerates *toward* a field whose polarity is opposite to its internal field, and *away* from one of the same polarity. The reason for this difference is obviously that the direction of least dynamic lattice "stiffness" reverses in these two cases.

**Why Oscillator Ellipticity Changes In A Force Field**

When we examine (in our mind's eye) the returning radial components of the reflected outgoing lattice-density wave of an asymmetrical oscillator immersed in a field, we can infer that those components returning from stiffer radial directions will arrive both faster, and with larger amplitude (because they suffered less inverse-square attenuation before reflection). Thus, not only will the oscillator center shift in the direction opposite to the region of maximum stiffness, and cause the frequency of the oscillator to increase, but the central ECEs will incur a shift as a group in this same direction, because of the radial variation in signal intensity. In turn, this central ECE group displacement, by setting up differential lattice stresses at the oscillator center, will provide more impetus for outgoing lattice-density waves in the direction of greatest lattice stiffness.

Thus, faster returning waves are reflected at the oscillator center with larger relative amplitudes than slower waves from other radial directions, and these larger amplitude outgoing waves suffer even quicker reflections if the field gradient increases*, thereby causing the oscillator ellipticity and the amount of central displacement to build, cycle by cycle.

* Accelerating *in* the direction of a *charge* field gradient is possible only for a *hovering* LD oscillator whose defect core has a charge *opposite* to that of the defects creating the charge field. The above process would work as described for a gravitational field.

**Why LD Oscillator Ellipticity Is Self-Perpetuating**

This analysis permits us to see how force fields create accelerations; now let us explore how an ellipsoidal LD oscillator behaves in a field free region of space. We should see that the only effect of removing an ellipsoidal LD oscillator from an ambient charge-field gradient is *to prevent changes in the amplitudes* of the signals returning from various radial directions. But, if the outgoing signals vary in amplitude radially, due to oscillator ellipticity, they will create differing amounts of overshoots at the same radial distances; hence, stronger signals will return quicker with larger amplitudes. Thus, the central stress asymmetry of an ellipsoidal LD oscillator will be rejuvenated each cycle, with the result that the oscillator center will shift in the same direction, and by the same amount, as in the previous cycle. These cycles will repeat forever, so long as the oscillator's trajectory takes it through field-free space*. Here is the fundamental explanation of an oscillator's continued drift through empty space.

* Of course, the largest dimension that field-free space could have, strictly speaking, is a *point*. Also, if we accept the argument that the center of universal shrinkage remains fixed, we see that a continuous exchange of a particle's geometric shrinkage with field shrinkage must continue during its drift through "empty" space.

**Why Maximum Drift Speed Is Asymptotic To The Speed Of Light**

Here is why a particle's drift speed through space can get arbitrarily close to the speed of light, but can never equal it:

- Drift speed is proportional to hovering oscillator ellipticity.
- This ellipticity increases as the hemispherical shrinkage component of the hovering oscillator (its *drift* component of shrinkage, $S_d$) increases relative to its spherical component (its *mass* component of shrinkage, $S_m$).
- It is obvious, however, that this hemispherical shrinkage component can never equal 100% of the hovering oscillator's shrinkage; hence the hovering oscillator's ellipticity can never increase beyond that produced by 100% hemispherical shrinkage, which, you will recall, is the ellipticity of IPP's photon, whose center drifts (steps) at the speed of light, c.

Thus, a particle's drift speed, v, should be:

**Equation 1** $$v = \frac{cS_d}{(S_m + S_d)}$$

From this relationship, you will see that the velocity, v, approaches zero, as $S_d$ approaches zero, and approaches light speed, c, as $S_d$ approaches infinity.

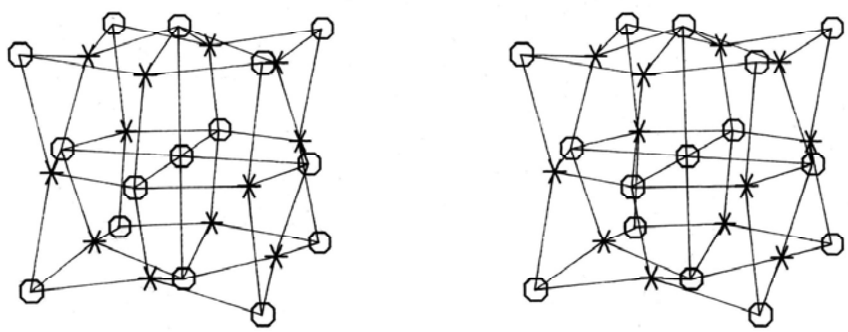
The hovering of a charged defect between two adjacent lattice sites is IPP's notion of **spin**. We consider this next:

**How To Visualize The Mechanics Of An Electron's Spin**

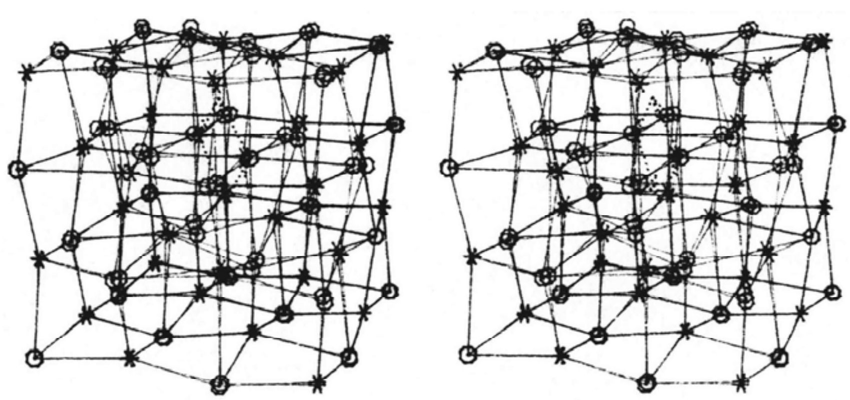
We must begin by describing an **electron's defect structure**. An electron is a *replacement defect*, which we can picture as an *out-of-place -ECE*, i.e. the *wrong-polarity* of ECE anywhere in an otherwise perfect cubic lattice. Because it is out-of-place, this -ECE will repel the *six* -ECEs in cardinal directions, and attract the twelve +ECE in face-diagonal directions, thereby forming a charge-displacement pattern, whose center would look like the upper 3-D pair of Fig. 1-4. However, as I have explained earlier, we must visualize this pattern as "hovering" between face-diagonally adjacent lattice locations, as I have drawn in the lower 3-D pair. Please use the enclosed 3-D plastic viewer for these (and other) 3-D drawings:

**Fig. 1-4 The Charge-Displacement Pattern Of An Electron**

**Basic Pattern**



**"Hovering" Electron's Charge-Displacement Pattern**



**How Much Of The Surrounding Lattice Rotates In Spin?**

From IPP's perspective, any local action ultimately affects all the ECEs of the universe; therefore, the above description of an electron's spin is only the <u>central</u> action of an infinite-extending lattice-density oscillation. This rotation obviously couples to surrounding ECEs in a manner which induces inverse-square diminishing waves of orbiting torsional rotations in the in-and-out lattice-density waves, which mimic, in attenuated fashion, the orbiting of the electron's central -1e charge. The radial distance they can move outwardly before oscillator reversal is inversely proportional to the hovering frequency; hence the radial size of the spin pattern also scales inversely with the oscillator frequency.

Now, considering that the mass-energy of any point-centered phenomenon is distributed in equal radial increments to infinity, we can infer that the portion of the electron's mass-energy which must be rotated scales inversely with the hovering oscillator's frequency. Hence, the electron's spin, being a measure of hovering action, should be constant for all (non-relativistic) drift speeds.

**What Sets The Frequency Of Spin? An Admission Of Ignorance!**

The concept of "hovering" seems so essential to an understanding of defect movement, and seems so satisfying an explanation of why an electron can respond to microvolt/cm gradients, that I was mortified to discover a series of apparently irresolvable paradoxes when I attempted to answer the above question. We can reveal these by asking several pertinent questions:

1) What hovering frequency would be required to cause an electron to drift at a speed of 0.9c? Answer: if we assume that an electron can move only one lattice face-diagonal per cycle of the hovering oscillator, the hovering frequency would need to be numerically equal to the number of lattice units that light moves in 0.9 second, or:

$$f = \frac{0.9c}{\text{ü}} = \frac{2.7 \times 10^{8}}{0.2 \times 10^{-15}} \approx 1.35 \times 10^{24} \text{ hertz}$$

The obstacle, here, is that this frequency requires the hovering oscillator to have an energy of:

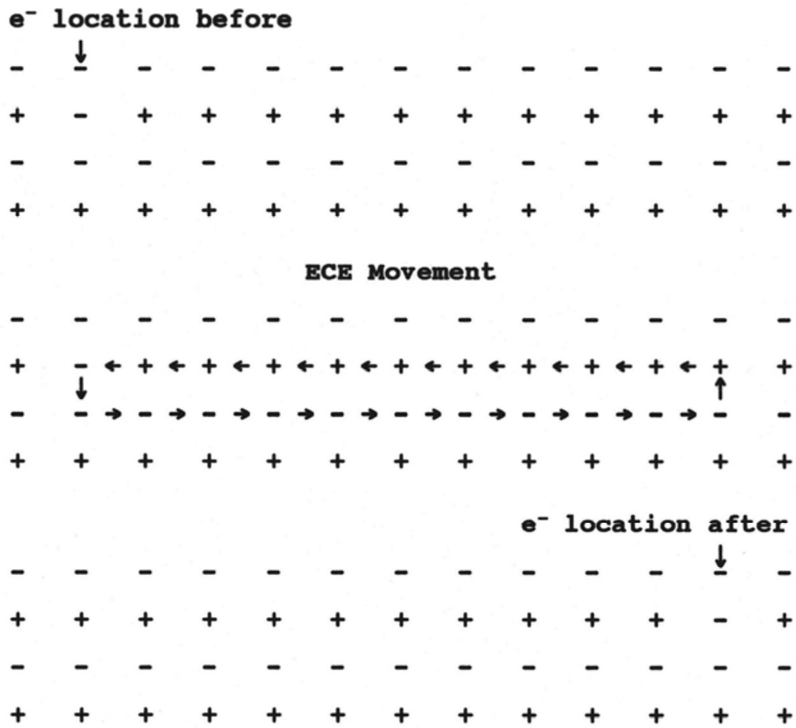
$$E = hf = 4.13 \times 10^{-21} \text{ MeV} \quad 1.35\text{s} \times 10^{24} \text{ cps} \approx 5600 \text{ MeV}$$

This energy is about 11000 times the electron's self-energy, 0.511 MeV, instead of 2.3 times its rest mass, $m_r$, as relativity predicts, and experiment confirms:

$$m_{v=0.9c} = \frac{m_r}{\sqrt{\left(1 - 0.9^2\right)}} = 2.29 m_r$$

2) What scheme might remove this absurd oscillator energy requirement? Perhaps a defect could change its location by hundreds or thousands of lattice units during a single oscillator cycle, by a mode wherein parallel chains of opposite-polarity ECEs move one lattice face-diagonal in opposite directions, with the necessary rotation occurring only at both ends. I show an abbreviated example of this motion in Fig. 1-5, below:

**Fig. 1-5 Opposite-Chain Mode Of Electron Translocation**




The three diagrams, above, show views before, during, and after electron translation of a section of the lattice in a 1,0,1 direction (i.e. a face-diagonal plane). I have assumed, for simplicity of drawing, that the electron is moving to the right, parallel to this face-diagonal direction, but the scheme would apply to any direction of movement, if we imagine the motion to be a sequence of synchronized oppositely-directed zigzags through the lattice. One possible argument in favor of this extended mode of defect translation is that it will be found necessary to explain the near-light speed of very low mass neutrinos, for which the hovering oscillator frequency will clearly need to be many orders of magnitude slower than an electron's. This parallel chain mode of defect translation is also essential for explaining the phenomenon of "charge-exchanges" in particle decays, and charge-exchanges effecting successive altered charge-distribution states of defect-pair clusters (IPP's concept of hadron particles).

This chain-of-ECEs mode of electron defect translation may seem, at first thought, to be ruled out by its apparent *indefinite* spin action. However, if we accept that the mass-energy of the hovering oscillator is distributed in equal radial increments to infinity, we should see that spin is certain to involve *huge* numbers of ECEs. Therefore, variations in the numbers of central ECEs initiating this volume effect may not be significant, because no central ECE moves more than *one lattice face-diagonal*, regardless of how many ECEs are in the moving columns.

Further reflection will undoubtedly permit someone to find a creative solution to this enigma. Until then, it is prudent to drop this question of hovering frequency, and move on to other matters.

**Why An Electron Appears To Be A Zero Dimension Point**

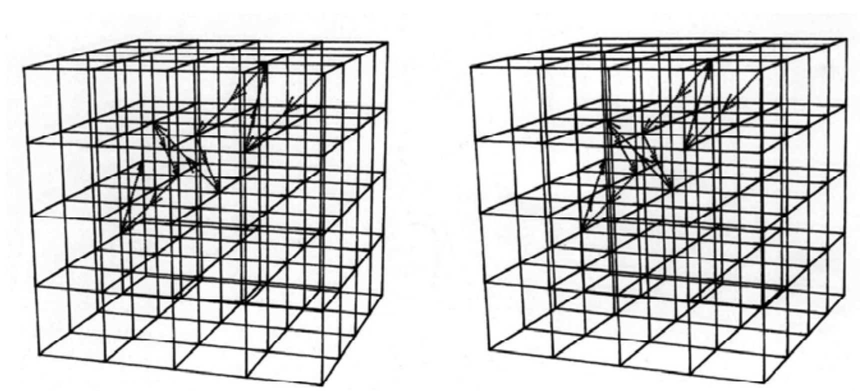
It puts a theorist in a bad light to argue that an electron has an infinite size, when scattering experiments show its size as $< 10^{-19}$ m. However, what these experiments measure is the apparent size of an electron's *center* of charge, and this does not conflict with IPP's concept, because IPP's center of charge (at low drift speeds) has zero dimension, being at the *center* of an orbiting charge.

**Why The Spin Vector Aligns With, Or Opposite To, Drift Direction**

This baffling assertion of Quantum Mechanics is easily understood from IPP's perspective. Here are the necessary concepts:

- *The rotational direction of spin is arbitrary*, but tends to be perpetuated because of ECE inertia.
- The *plane of spin rotation is constantly shifting*, as the hovering oscillator drifts through the lattice. Whenever the oscillator center approaches closer to a new defect site than to one of two previous sites, the direction of the defect's translocation will suddenly shift, so that it is now between the new site and the closest old site. The angle of shift is typically 60 degrees, though 90°, even 120° will sometimes occur. The direction of rotation will be preserved.
- For *any arbitrary trajectory* of the hovering oscillator through the space lattice, *these changes in hovering direction will be systematic*, and such that their spin vectors integrate to a direction aligned with the direction of drift. This is easily seen in the 3-D representation, below, which shows the changes in the spin vector's direction resulting from an oblique trajectory through the lattice:

**Fig. 1-6 Why Integrated Spin Vector Aligns With Drift Direction**



**The Origin Of The de Broglie Matter-Wave**

The (absolute) de Broglie matter-wave is simply the lattice-density wave associated with the hemispherical shrinkage (the drift) component of a particle's hovering oscillator. The de Broglie matter-wave is implicit in the ellipsoidal shape of a drifting hovering oscillator, which can be considered to be a summation of a spherical oscillator with a "captured" ellipsoidal photon. Hence, it is manifest as a low-frequency lattice density modulation of the hovering oscillator's frequency. If we consider this ellipsoidal hovering oscillator as having a fixed spherical "mass" component of shrinkage, $S_m$, and a variable hemispherical "drift" component of shrinkage, $S_d$, we see that the hovering component of energy is unchanging, and proportional to the particle's mass, while the drift component can take any value. The *ratio* of drift shrinkage to hovering shrinkage (i.e. the oscillator's ellipticity) determines the increment of the oscillator step distance (wavelength), and the frequency of the oscillator determines how many shifts occur each second. Since an oscillator's wavelength is inverse to its frequency, we perceive that *an LD oscillator's drift velocity, v,* through space *is determined solely by its ellipticity*:

$$\text{Hence:} \qquad v \approx \frac{cS_d}{S_m}$$

And, *if* $S_m$ is the particle's mass, the momentum of a non-relativistic particle (where $S_d \approx S_m$) is clearly proportional to the drift component of its hovering LD oscillator:

$$S_m \propto m; \quad v \propto \frac{S_d}{S_m}; \quad mv \propto S_m\left(\frac{S_d}{S_m}\right) \propto S_d$$

Therefore, we see why the de Broglie matter-wave is proportional to a particle's momentum. It is simply because: $S_d \propto mv$

I don't know how to incorporate Planck's constant into this proportionality to produce de Broglie's relationship, because I have been unable to discover the actual value for the electron's hovering frequency in my analysis of the electron's spin. The impediment is in trying to ascertain what fraction of the particle's infinitely extended mass has to be moved back and forth during the hovering cycle. Perhaps some of you will see how to do this. Incidentally, you will, of course, perceive that the hovering frequency is also present as a lattice-density wave; however, its frequency is much too high to be detected by diffraction effects.

## IPP's Concepts For Particles: Lattice Defects

### An Apparent Difficulty

**Question:** How can an ether theory find defect structures for hundreds of particles, when a moment's reflection convinces us there can be only three basic types of single lattice defects? These are:

- *void defect* — created by a missing ±ECE.
- *excess defect* — ±ECE wedged somewhere in the lattice.
- *replacement defect* — wrong polarity ECE in a lattice site.

**Answer:** These three types of defects are adequate for the electron and muon families of leptons, as I explain below. *All the other particles*, including the tau quasi-lepton*, are comprised of clusters of *collapsed-void defect-pairs*, whose clusters vary in numbers of defect-pairs from pions = 1, to upsilons = 16. *Defect-pairs* are formed when pairs of voids find themselves in a cardinal alignment in a region of "condensed" space (i.e. at the center of a strong lattice-density oscillation). In this situation, a void collapses into a lattice structure which has orthogonal zones of contraction & expansion. Pairs of collapsed voids, whose zones of expansion/contraction have opposite orientation can, therefore, join together in a stable structure through mutual cancellation of each other's distortion.

* The primary reason for suspecting that a tau lepton is a meson resonance is that about 64% of its decay modes yield lighter mesons. I give its defect-pair structure & mass calculation in my 2nd chapter.

Since voids collapse only in cardinal lattice planes, defect-pairs have *quantized* spacings. Because these spacings vary according to cluster geometry, I have been able to find a way to calculate defect-pair masses vs. defect-spacing, which has permitted finding plausible structure for numerous hadron resonances, and validating these by mass calculations vs. experimental values. These compare often within ±0.01%. Defect-pairs also yield a calculable concept for strong force bonds, because each defect-pair has residual zones of expansion/contraction distortion which can be partially canceled by a neighboring defect-pair of suitable orientation.

### Assigning Defect-Types To Various Particles

1) **±±* <u>replacement defects</u> = <u>electrons/positrons</u>:** a replacement defect is a dynamic lattice distortion pattern resulting from removing an ECE of either polarity from any location in the space lattice, and replacing it with an ECE of opposite polarity. Since both the removal and the replacement results in a 1/2e charge of the *same* polarity, a replacement defect generates a charge-displacement pattern with a charge effect of ±e (See Fig. 1-2). Charge-displacement patterns are only one component of a particle's complex dynamic distortion pattern; other components are hovering (spin), shrinkage (gravity), and ellipticity (drift).

   * This charge prefix shows the *number of ECE "charges" each defect manifests.* These double charges indicate that replacement defects have twice the charge of ECEs.

   **Why replacement defects are electrons/positrons:**

   - This is the only defect structure that permits assigning ECEs half an electron's charge, a vital necessity for this theory.
   - The replacement defect's mode of production, (i.e. removal of an ECE, followed by replacement with an opposite polarity ECE), is consistent with the phenomenon of electron/positron pair production. This creation event is easily understood as *a rotation of adjacent opposite-polarity ECEs into each other's sites.*
   - The fact that a replacement defect *hovers* permits us to understand its **wave-particle duality**, since it is both point-centered *and* a lattice-density oscillation.

2) ± **<u>void defects</u>** = **<u>muon neutrinos</u>:** a dynamic lattice distortion pattern resulting from a missing ECE anywhere in the space lattice. Voids have a charge of ±1/2e. Our theory identifies *-voids* as *muon antineutrinos*, and *+voids* as *muon neutrinos.*

**Why voids are muon neutrinos:**

Assigning ±1/2e charges to muon neutrinos may come as a surprise, because these are currently assumed to be neutral particles. However, consider the following:

- Identifying voids as muon neutrinos, and void-pairs as electron neutrinos (see below), permits the theory to differentiate neutrinos into two types, with different properties, as experiments have demonstrated. It is easy to infer that a void will be more massive than a void-pair, because proximate opposite-polarity voids will mutually cancel each other's charge-fields, and this is supported by LBL mass estimates: numu <0.27 MeV/$c^2$: mue <5.1 eV/$c^2$. However, I give an argument in my book's cosmology section, which suggests that the mass of a ±void is more probably <1 meV/$c^2$.

- A half-charge void can neatly *explain so-called "neutral-current interactions"* between muon neutrinos and protons. This explanation requires our later understanding of the process by which a relativistic ±void can convert its momentum to mass in a proton's vicinity by converting momentarily to a c-void, thereby greatly extending interaction time and momentum exchange.

- A half-charge neutrino *permits charge preservation* when a charged-pion decays to half-charge muon (see below) and numu.

- A half-charge neutrino permits understanding *redshift* in a static universe (i.e. by ionization of void-pairs by photons), and *background microwave radiation* (energy released when opposite-polarity voids recombine), and may explain the missing solar electron neutrinos (photon ionization of solar nue's into numu's, with subsequent deflection by the earth's magnetic field). I explain these matters in more detail, later.

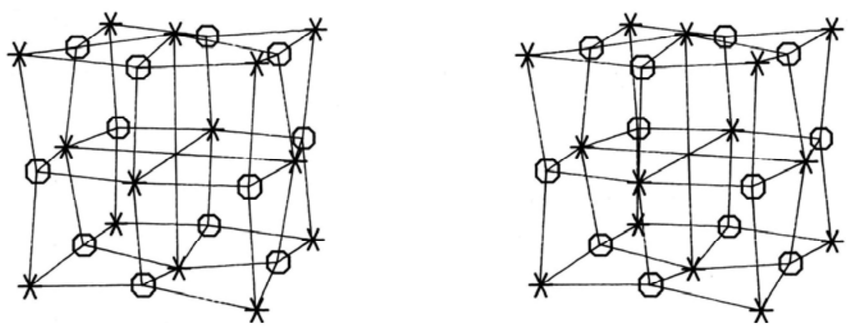
- A half-charge neutrino is *crucial toward understanding particle decay* as an *induced* phenomenon, rather than *spontaneous*, as is currently believed. In my book I show a number of decay scenarios in which passing half-charged voids interact with neutral defect-pairs to "decouple" their oppositely-charged c-voids, or interact with clusters containing full-charge defect-pairs of both polarities to fractionate them into isolated defect-pairs, or into multiple smaller clusters. Also, in nuclear decay, we shall see that half-charged voids play an essential role in establishing a suitable charge ambience necessary to "drive" a charge-exchange (explained in my second chapter) between a nucleon and a void-pair, by which a neutron is converted to proton, or proton converted to neutron (in nuclei).

- *Voids will exhibit spin*, because an ECE of the vacated polarity will hover between two adjacent defect locations. However, the *action* of this spin should differ greatly from an electron's spin. In fact, from IPP's perspective, the idea of conservation of spin in particle interactions is an unsupportable notion.

- Finally, though possessing a half-charge, *a void has almost zero possibility of ionizing an atom.* At low velocity its mass is so low (I argue it is <1 meV/$c^2$) that very little momentum exchange can take place with orbital electrons, and at relativistic speeds (and high equivalent mass) it passes by so fast as to depart before much deflection has occurred. Therefore, *it will be unobservable*.

**Fig. 1-7 Charge Field Of A Plus Void Defect**



3) **<u>void-pairs</u> = <u>electron neutrinos/antineutrinos</u>:** *Pairs of opposite-polarity voids* can join together in a oscillatory system. IPP identifies these pairs as *electron neutrinos,* (or antineutrinos, since IPP asserts that there is no difference between them).

**Why neutral void-pairs are electron neutrinos:**

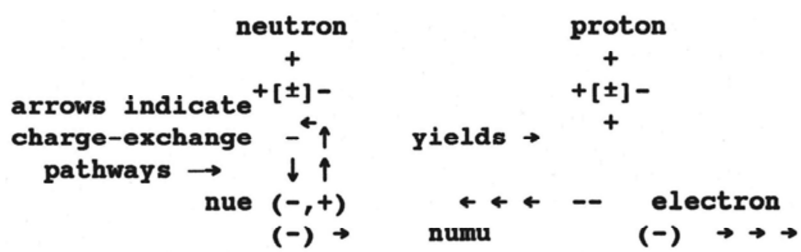
- The neutral void-pair is an obvious candidate for an electron neutrino, since it is clearly the *lightest* defect system available, and has the capability of interacting with nucleons in a close-enough approach, as we shall see. Here are some other details:

- Since opposite-polarity voids occupy *mutually-exclusive* lattice locations, and have *nothing to exchange with each other*, they cannot annihilate each other. Therefore, we assume that isolated void-pairs, like isolated lone voids, have infinite life. Both, however, can change into other defect types in interactions, or can annihilate by merging with suitable polarities of excess defects.

- Since they cannot annihilate *each other*, paired opposite-polarity voids will accelerate past each other, slow to a stop, and return, endlessly. Their points of maximum separation will be defined by their central velocities interacting against their mutual attractions. Their maximum central velocities will clearly be limited to their mutual velocities of escape, while their individual central velocities will be determined by the manner in which they found each other's company. Void-pairs may have energy levels; investigating this possibility should make an interesting thesis subject.

- Like lone voids, visiting void-pairs can *induce decay processes*. In fact, many so-called "spontaneous" decays which are currently presumed to result in electron antineutrino emission, such as neutron decay, n → p + e + @nue (@ = anti), can be better understood as being *initiated* by a visiting "thermal" void-pair, catalyzed by the simultaneous presence of an appropriately positioned lone -void (to provide the necessary charge gradients to induce charge exchange fusion (replacement) of the excess -ECE from the neutron into the -void of the nue). This can be diagramed as follows, where all the charges represent defects of ±1/2e value:

**Fig. 1-8 nue Induced Decay Of Neutron To Proton**



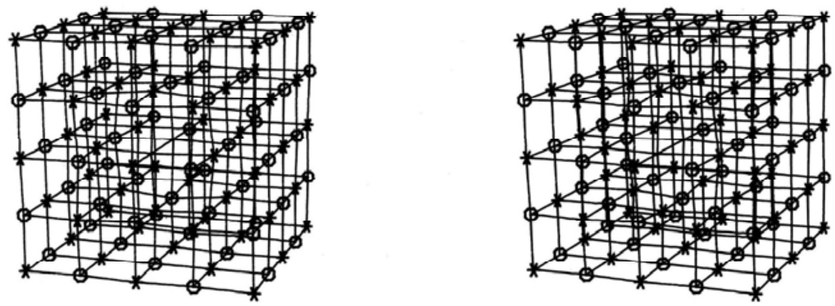

- Neutron and protons, from IPP's perspective, are structures with three mutually orthogonal defect-pairs, so you should interpret the central "[±]", above, as a defect pair comprised of opposite polarity c-voids, whose axis extends into the plane of the paper. You will need to acquire more concepts, particularly, what charge-exchanges are, in order to understand the details of the above scenario, but you should understand that the nue disappears in the interaction to become an electron, while the numu continues on unchanged, but with variable change in its momentum depending upon the geometry of the interacting particles. It is crucial to the above scenario for the neutron to be in its high mass $n_2$ state, i.e. possessing three neutral defect-pairs with defect spacings of 10ü, 10ü & 8ü (ü = lattice units). This state provides the transient mass excess needed to convert the departing minus void to a minus excess, so that it can fill the nue's void. It also provides the greatest charge polarization of the neutron, so its negative end has the greatest attraction for the plus void component of the nue. I expect you to be puzzled by these new terms, but, in due time, they will become clear.

- Void-pairs have one other outstanding potential — *they can turn into neutral* <u>defect-pairs</u> (QCD terms this structure, a "neutral pion"). This metamorphosis can occur, if a void-pair drifts into a center of sufficient *unutilized* spherical shrinkage (IPP's term for this is undedicated shrinkage). This is one of the common ways for defect-pairs to be created, although many other scenarios can be imagined. In making this conversion, a void-pair's mass can change from <<1 meV/c² to ≈ 136

MeV/$c^2$ (LBL's mass value for a neutral pion), or even higher, if more undedicated shrinkage is available. This potential of void-pairs (nue's) to convert to defect-pairs must always be kept in mind, in analyzing particle interactions.

**Fig. 1-9 Charge Field Of A Void-Pair**



- You will notice that the void-pair has essentially *no* charge field. Thus, very little geometric shrinkage is needed for its formation.

Now, let us take a small detour to bring out some other insights provided by the concepts of voids and void-pairs:

### The Origin Of Redshift & Background Microwave Radiation

How can an ether theory, with non-expanding space, explain these *validated* experimental findings? Here's how: "Thermal" void-pairs are assumed to be abundantly distributed throughout inter-stellar space. These low-velocity void-pairs are very weakly bound together, and may be ionized when the *center* of a photon's ellipsoidal LD oscillation *coincides* with the center of mass of the void-pair. This process produces separated plus and minus voids, and a redshifted photon, since the ionization energy is subtracted from the photon's energy. The photon's trajectory is not altered, because the two void components of a void-pair have *precisely* the same mass.

The opposite-polarity voids released by this redshift ionization process will circulate through space, and will eventually slow to a velocity which permits them to combine with other voids, to form new void-pairs. This joining together results in an evolution of energy, because their opposite-polarity charge fields are largely canceled. *Here is the source of the background microwave energy,* which has a black-body character, because of the random velocities of the recombining voids. The released microwave photons obviously have equal probability of being emitted in all directions, which nicely accounts for the observed angular uniformity of BMW radiation.

For this redshift/BMW explanation to be credible, it is obvious that the decrement in the photon's energy per ionization event must satisfy two requirements: it must be proportional to the photon's energy, and it must be a very small proportion of a visual light photon's total energy. The average energy of the background microwave radiation (0.00046 eV) suggests that this may be true.

**The Origin Of Heisenberg's Indeterminacy**

From the IPP perspective, the root cause of Indeterminacy is an ambience of hidden variables. Space is teeming with *void*-pairs, lone *voids*, photons, and grain-boundaries, and each of these may interact with a particle in a manner which alters the ellipticity of its hovering oscillator, and, hence, its drift speed and direction.

Of these four agents of disturbance, only photons can be excluded from experimental situations. If lone *voids* and *void*-pairs are assumed to be neutrinos, there is ample experimental evidence that they interact so little with matter that they can't be screened from experimental situations. The effects of grain boundaries could be minimized by conducting experiments in a space ship stationary with respect to absolute space, but achieving this orientation would be difficult, since one would have to accelerate this vehicle to a speed of approximately 825,000 m.p.h. relative to the sun*, in precisely the right direction.

* *Physical Review D*, 1 August 1994, p. 1234, gives a value for the drift of the solar system relative to the cosmic background radiation as 369.5 ± 3 km. per second. This should, also, be a measure of our speed through absolute space, in the light of my redshift/BMW explanation. Hence, if passage through grain boundaries is the primary cause of internal transitions in nuclei, as I will suggest, one could use the prolongation of I.T. half-life, both as a means of determining when the space ship is stationary with respect to absolute space, and as proof that grain-boundary transits are the cause of I.T. A much less costly experiment, but less definitive, would be to compare I.T. half-lives at half-year intervals when the earth's orbital velocity adds and subtracts from our velocity through absolute space.

I hear you saying, at this point, "If voids and void-pairs have so little interaction with matter, how can they disturb the trajectories of particles?" Here are some ways:

Since IPP argues that *void-pairs* are capable of being ionized by photons (i.e. by pure ellipsoidal LD oscillations), we can presume that they will also be ionized by interactions with the ellipsoidal hovering LD oscillations of particles. This interaction would decrease a particle's momentum very slightly, but not alter its direction of motion.

Since *lone voids* possess a charge of ±1/2e, they will obviously be capable of deflecting a charged particle on close approach, *if they have mass*. IPP asserts that they do, the evidence for this being the phenomena of redshift and background microwave radiation (as interpreted by IPP).

Since both *void-pairs* and *lone voids* have the capability of collapsing in the presence of excess local shrinkage, their interaction masses may become orders of magnitude greater when they interact with particles able to donate transient mass to them, i.e. those comprised of defect clusters possessing multiple charge-exchange states of differing mass values. These donated transient mass increases would greatly exaggerate the amount of trajectory disturbance from both ionization and charge deflection.

The *trajectories of <u>neutral</u> clusters* of defects will be largely immune to these charged neutrino encounters, but both they and charged defects and charged clusters will be affected *by grain-boundary encounters*, where they must pass through a narrow region of lattice dislocations and into a region of altered crystal orientation, and, in the process, see strong lattice irregularities resulting from close-packing effects. These grain-boundary influences should result in permanent changes in the hovering oscillator's ellipticity*.

* This conclusion raises the question, "What equal & opposite change occurs in the grain boundary to conserve momentum?" This is particularly perplexing, if we accept that grain-boundaries possess only static spherical shrinkage! Here is my current interpretation: The spiral and step dislocations normally found in grain-boundaries sit in a very unstable equilibrium. The slightest shift in ECE orientations in this boundary layer may increase, or decrease, the amount of static spherical shrinkage captured in these dislocations. We presume, then, that the transiting hovering oscillator may induce either additions to, or subtractions from, the boundary layer's spherical shrinkage. Either of these is manifest as a shift in the magnitude & the center of the boundary layer's non-oscillatory spherical shrinkage, which creates a moving wave of hemispherical shrinkage of precisely equal and opposite momentum to the hemispherical shrinkage change in the drifting defect system.

You will perceive that it is only the completely random nature of these neutrino and grain-boundary encounters, some adding ellipticity, some subtracting ellipticity, which allows the drifting, hovering particle to arrive more, or less, in the direction in which the force fields had launched it, and with nearly its endowed momentum. *Here is the root cause of Heisenberg's Indeterminacy*.

**Could Grain-Boundaries Be A Source Of Dark Matter?**

Grain-boundaries obviously require shrinkage for their formation. Hence, they will shrink the space lattice, thereby creating gravitational fields which will extend throughout the infinite polycrystalline lattice of space. This would seem to be precisely the effect needed to account for the observed mass halo around galaxies.

**Could Grain-Boundaries Be A Source Of Gamma-Ray Bursts?**

Suppose that a grain-boundary could develop a cavity/pyramid structure of substantial size due to a spiral dislocation. Could this structure be collapsed into a smaller area by the passage of a high mass nuclei through its apex. If so, a substantial amount of the grain-boundary's spherical shrinkage would be released in the form of undedicated spherical shrinkage, which would instantly split into two oppositely-directed high-energy photons.

**An Explanation For Quantum-Mechanical Tunneling**

If we accept that ±1/2e charge *voids* are billions of times more abundant than electrons in all experimental situations, we can certainly imagine transient configurations of multiple *+voids* within a semi-conductor junction sufficient to reverse the retarding field a close-by electron sees, thereby causing this particular electron to accelerate through the junction. It is the exceedingly thin junction of a tunnel diode which permits a single transient reversal of field to allow the electron to penetrate to the other side and emerge with enough energy to do work. And it is the exceedingly short transit time of this effect which defeats the normally completely random character of electron/void interactions.

**We return, now, to our analysis of lattice defects:**

4) ± excess defects = muons: a dynamic lattice distortion pattern resulting from wedging a single ECE of either polarity into the neutral lattice of "empty" space. Excesses have a charge of ±1/2e. *Minus excesses* are identified as *muons;* while, *plus excesses* are identified as *anti-muons.*

**Why a half-charge excess is a plausible muon:**

Half-charge muons and numu's explain why the muon family differs from the electron family, thereby sparing particle physics the embarrassment of the non-concept, *muon-ness*. The half-charge also explains why a muon *never* decays electron/gamma: it *couldn't conserve charge* in this postulated decay!

Could physicists be mistaken in their belief that muons have the same charge as electrons? Obviously they feel very secure in their belief that muons have unity charge, but this conclusion ultimately rests upon their assumption that muon neutrinos are neutral particles. When one views numu's as ±1/2e charge particles, as IPP does, ±1/2e charge muons explain observed decays equally well.

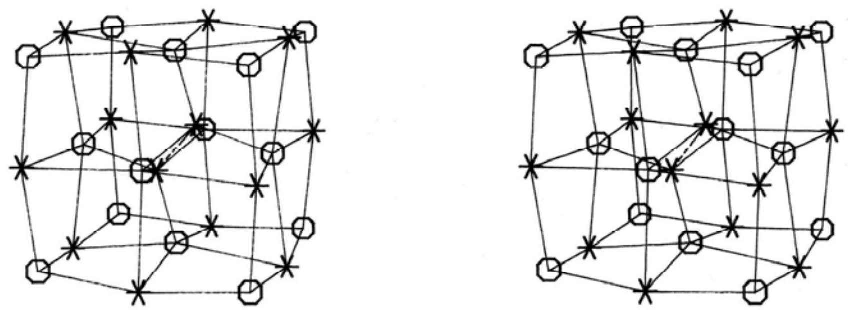
**The Distortion Pattern Of An Excess Defect:**

It shouldn't be hard to find room in the space lattice for an extra ECE. The simple cubic lattice is the least compact arrangement of touching ECEs, and more compactness could result from rearrangement toward the body-centered cubic, or, in localized regions, toward hexagonally close-packed. So we simply need to find a location for an *excess* where its presence will lead to close-packing effects. There obviously isn't room for another ECE in the center of a lattice cube, but there is plenty of room for one inside a supercube (any 2x2x2 lattice-unit region of the space lattice). There is room, because the diagonal distance between the centers of opposite corner ECEs of a supercube is 3.46ü (ü = symbol for lattice unit). Thus, there is room for almost 1.5 more ECEs along the supercube diagonal, if we let the supercube exterior ECEs bulge-out somewhat.

So let us introduce a second +ECE into this supercube interior. What we should expect is that the two central +ECEs will seek an accommodation along one of the four super-cube diagonals, producing a rearrangement of the surrounding ECEs, somewhat as shown in Fig. 1-10, below (although you will see that the drawing fails to produce the identical center-to-center spacings of opposite-polarity ECEs that the Theory demands). Because the two central +ECEs are equally displaced from the pattern center, with nothing to distinguish one from the other, we will perceive the *excess* +ECE as losing its identity and propagating through the lattice as a *pair of +ECEs*, each contributing a +1/4e charge effect.

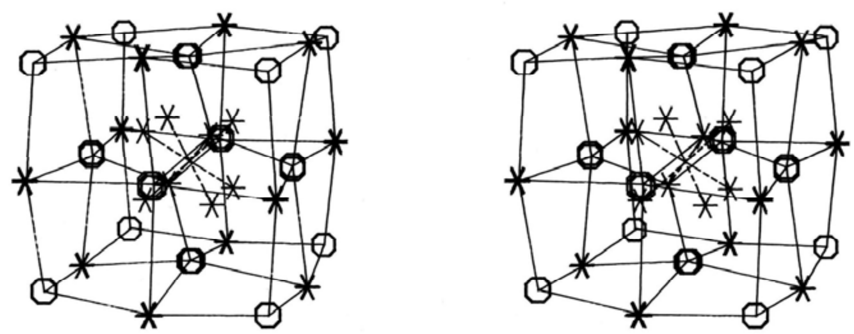
 

**Fig. 1-10 The Geometric Shrinkage Pattern Of An Excess Defect**



When the *excess* defect wanders through space, we should see that either of the two "central" ECEs in the super-cube can become the excess ECE in the next defect location, which will be one of the super-cubes which interpenetrates the one currently occupied. The direction of motion of the vacating ECE will unavoidably cause a different diagonal direction to be assumed by the two "central" ECEs of the next super-cube. Thus, as the *excess* moves through the space lattice, all four supercube diagonal directions will have equal probability of occupancy. This alternation of direction will cause the *excess* to interact with other defects as if it were spherically symmetrical (in a statistical sense). I try to show this effect, below:

**Fig. 1-11 How The Excess Defect Achieves Spherical Symmetry**



5) ± <u>collapsed-void defect</u>, or ± <u>c-void</u> = building block of hadrons: a dynamic lattice distortion pattern resulting from the collapse of a ±void, when it finds itself in a region of compressed space. This pattern has orthogonal zones of radial expansion and radial contraction which stretch in inverse-square fashion toward infinity, and its formation requires exorbitant amounts of mass-energy. Thus, c-voids, like their QCD alter ego, quarks, are never found alone, but are always found joined together with another c-void, a marriage which greatly reduces the mass-energy requirements of their formation. The two mating c-voids must possess distortion patterns of opposite geometric orientation, so that the contraction zones of one cancel the expansion zones of the other, and vice-versa. This mutually canceling combination of two c-voids is called a defect-

pair, and is of such importance to IPP that I devote the next four chapters to it. However, before we plunge into these details, let me tell you how I discovered the defect-pair idea, because this historical note may aid your comprehension of its structure.

**How A Model Of A Bipolar Ether Made IPP Possible**

The stimulus for my new geometric approach to physics was an article, "Photons as Hadrons", by Frederick V. Murphy and David E. Yount, in the July 1971 issue of *Scientific American*. This article described experiments at the Stanford Linear Accelerator Center in which photons billions of times more energetic than visual-light photons were caused to strike targets of various metals from beryllium to uranium. Rather than being merely reflected or absorbed, these energetic photons occasionally reacted with the various atomic nuclei to produce large quantities of pions. This led the authors to speculate that perhaps high-energy photons took on a hadronic character, and transmogrified on collision with matter into vector mesons, which then decayed into pions within a few nuclear diameters. My reaction was that this interpretation, while clearly justified, missed an obvious point: perhaps what had transmogrified was not the impinging photon, but, rather, *space, itself!* Perhaps space is composed of the "ingredients" of matter, and energy somehow rearranges these ingredients of space to produce matter. This simple deduction launched a chain of ideas which led to this book.

**Why & How The Model Was Built**

My investigations began with the notion that particles were defects in the space lattice, but after mulling this for a few weeks, it became clear to me that the *essence* of a particle was not its defect composition, but, rather, it was the *distortion pattern* it would induce into the space lattice. Trying to visualize a *lattice defect* was hard enough, but how do you visualize its three-dimensional pattern *stretching to infinity?* I decided to construct a model of bipolar space, using Q-tips, the opposite ends of which I dipped into bright orange and blue Hyplar paint. After these were dry, I laboriously sewed groups of six like-colored ends together to produce an 7 x 7 x 7 cubic lattice, which I suspended inside a cubic frame by rubber bands connected to each node on the six faces of the cubic Q-tip structure, so that the naturally floppy structure would assume a cubic shape, but would be free to be distorted.

**An Experiment That Yielded The Collapsed-Void Concept**

This effort, born of my need for physical objects to manipulate to really understand something, proved to yield the crucial concept upon which IPP depends. And, without this model of space, I am certain I would never have thought of it! Having built the model, I now needed some way to simulate a defect, and what better way than to squeeze together diagonally-opposite nodes of one of the lattice's faces. This action would be equivalent to removing one of these two like-charge entities, thereby producing a charge-effect in the lattice equal to, but opposite to the charge of the missing ECE.

The pattern in the Q-tip lattice which resulted from this squeezing action was intriguing and provocative! The surrounding cubic elements of the lattice became distorted such that along one diagonal all the face-diagonals were compressed, or contracted, while along the opposite diagonal, all the face-diagonals were expanded. If the squeezing were done in the center of the model, the contraction/expansion distortion extended over the entire model, and the distortion at the external faces of the model showed clearly that this contraction and expansion would extend to great distances.

**Opposite Directions Of "Squeezing" Produces Distortion Cancellation**

I soon was pinching together multiple points in the structure, observing that the total distortion was considerably reduced if two points along a common cardinal axis of the lattice were pinched together in opposite face-diagonal directions, while the distortion was accentuated if they were pinched in the same direction. Something of more subtlety then became apparent. If the pinchings had opposite slants, and were of the *same* color, they would be an odd number of lattice units apart; if they were of *opposite* color, they would be an even number apart. This seemed to be of noteworthy significance, but just how I could use it in my quest was not immediately apparent.

**The Kind Of Space-Lattice Implied By Rigid Q-Tips**

About this time I began to think more deeply about the implications of using rigid Q-tips to form the lattice, rather than making the connections compliant, such as with springs, or stretchy materials, as I had originally intended. With rigid interconnections, I had made the equivalent of a crystal lattice composed of incompressible spheres all in contact with each other, where each node was at the center of a sphere. Of course, this was true only if one limited the displacements to rather small angles from orthogonality, for the unsupported structure would collapse into a shallow heap.

**Implications Of A Space-Lattice Comprised Of Touching Spheres**

When I viewed my lattice as a group of touching spheres, it became evident that the result of pinching two nodes together was equivalent to one sphere disappearing, while the other moved midway between the two previously undisturbed lattice locations. With a few more years of thinking, this action became my definition of a "collapsed" or c-void defect in the space lattice, while the reduced distortion of cardinally related pinchings of opposite slant, became the mechanism by which two c-void defects became married together, forming a *defect-pair*.

**Why Paired Collapsed-Void Defects Bond Together**

The reason for bonding together was not at all clear until I began to associate lattice distortion with lattice shrinkage, and lattice shrinkage with both energy and mass. When this notion is accepted, it is obvious that two isolated collapsed defects would create more distortion, and hence would sum to more mass-energy than two defects married together by distortion cancellation. Since energy would have to be supplied to move paired c-voids apart, they would perhaps form a stable particle!

**What Led To The Concept Of "Defect-Clusters"**

The notion of defects paired together in a cardinal lattice direction immediately suggested clusters of paired defects utilizing the other cardinal directions of a cubic space lattice. Would not a proton, being the most stable of the complex particles, have three defect-pairs, one in each of the three cardinal directions? This idea seemed so compelling, that I accepted it at once, even though I could see no means of proving it, and the requirement of six defects meant that each defect could possess only half an electron's charge, if the defect cluster were to have a unit positive charge (4 plus, 2 minus c-voids).

**Resolving The Question Of Defect Charges**

This insight led quickly to others. If a c-void defect is assigned half an electron charge, then a simple void would also have half the electron's charge, and so also would an excess defect which vacated a void; therefore the excess defect could not be the electron, as I had initially speculated. What *could* create a defect having double the void defect charge? Suppose we could remove an elemental charge entity (ECE) of one polarity from the lattice and then replace it with one of opposite polarity? Would not each action produce a half-charge effect of the same polarity, leaving the lattice doubly charged? This out-of-place ECE, or replacement defect, became my electron.

**Finding Defect Structures For Muons And Neutrinos?**

I was elated to have found plausible defect structures for the two basic building blocks of matter, but perplexed about which defect structures to associate with the other three members of the lepton family, the muon, and the electron and muon neutrinos (the tau had not been postulated at that time). I could think of only two other defect possibilities, the simple void defect and an excess defect. Each of these could have only half the electron's charge, whereas the muon was assumed to have the same charge as the electron, and both neutrino types were assumed to be without charge! I gave some thought to the possibility that opposite polarity voids might join together to form a neutral electron neutrino, and a couple of these duos might cluster together to form a muon neutrino. And, perhaps, two excess defects of the same polarity might somehow join together to form a muon, but it seemed highly unlikely!

An unpalatable alternative was to consider that perhaps physicists had erred in their charge assignments of these particles; maybe muons and neutrinos are half-charged, instead. I couldn't recall anyone even speculating about this possibility, so this did not seem a very viable notion, and I dismissed it with lingering affection.

These insights took just a few months, but they created a surety that I was onto something profoundly significant, and they gave me the motivation to devote full time to exploring its potential. I had taken color stereo pictures of the distortion pattern I had created in my model of the space lattice, and have found these an invaluable reference, over the years, as I thought more deeply about collapsed voids and defect-pair clusters, and about other lattice defects. And it was this great value of 3-D images to me, which convinced me of the necessity of including 3-D drawings, and viewing means, in my book.

**A Note About The 3-D Drawings In This Chapter**

These drawings have appropriate scale to be viewed with the plastic 3-D viewer which accompanies this book. Notice that the spherical nature of the ECEs is not shown. Instead, the two symbols (* = +ECE, o = -ECE) merely show the locations of the ±ECE *centers*. The lines interconnecting the ECE centers have been added to aid in visualizing the resulting lattice distortion pattern.