Infinite Particle Physics

Chapter 7 - How Energy Creates Particles

Tracks On The Recording Media

The raw data from Particle Physics experiments are pointer readings on experimental apparatus, and curved tracks on film & computer screens. Much can be learned about particle creation events by analyzing these data mathematically, but the sense of what is happening at the point of annihilation & re-creation can only be illuminated by viewing these events from some theoretical perspective. Currently, physicists know what goes into these creation events, and what comes out — what colliding particles, at what energies, produce what mix of created particles — but they know very little about the mechanisms which produce these observed changes. Let us see what IPP can contribute toward revealing these mechanisms. These explanations must always begin with the IPP concept of *undedicated shrinkage*, so let's be sure we know precisely what IPP means by this term, and then plunge more deeply into the mechanics of its production, and its utilization.

IPP's Concept Of Undedicated Shrinkage

Undedicated shrinkage is a transient condition in a region of the space lattice wherein a *static*, or *slow-moving* lattice-density oscillation has been created by particle collisions, particle annihilations, or photon-particle, or photon-photon collisions. This *momentary* "static" spherical lattice-density oscillation is neither energy, nor matter, but is, rather, *undifferentiated mass-energy!* We are led to infer its existence, because even carefully-controlled particle collisions yield a variety of end-products & momenta, attesting to the presence of an intermediate mass-energy translating mechanism.

Here are five main scenarios by which **undedicated shrinkage** is produced, or released:

1) By mutual annihilations of matter/antimatter forms of the same defect types, or defect-cluster types.

2) By merging of two oppositely-directed photons, or merger of a photon with a defect system.

3) By particle interactions resulting in partial cancellations of fields or momentum.

4) By induced reduction of c-void defect-pair spacings, or induced reduction of strong-force bond spacings.

5) By induced defect transmutations, or by induced defect-cluster rearrangements.

The Current Concept Of Particle Collisions

What is the current concept? I suspect a particle physicist views particle collisions as two insensibly small, incredibly dense bits whacking into each other in the ambience of the best vacuum he can produce, i.e. in a sort of 'empty' space, although one that is usually laced with strong electrostatic & magnetic fields. He infers that a collision has happened because he has apparatus that produces either photographic or computer reconstructed images which show the impinging particles fractionating into a burst of other tracks.

IPP's Concept Of Particle Collisions

Now, how does an IPP convert interpret this 'collision' evidence? He views this, not as an *impact*, but merely as a *confluence* of the two centers of two infinitely extending dynamic distortion patterns, and not in 'empty' space, but just in a relatively uncluttered region of the space lattice. He believes that the mass-energy of the impinging particles is not concentrated, but, rather, is distributed in equal radial increments to infinity; thus, the point of confluence has such a small concentration of mass-energy that the two particles merge together with nary a bump! All the observed fractionation into other particles is attributed to the local rearranging of the space lattice, creating more defects & more ellipsoidal hovering oscillators, under the impetus of the two merging ellipsoidal hovering LD oscillators associated with the two merging defects (or defect clusters)".

Therefore, keep in mind, as we discuss creation events, *that collisions don't "shatter" space*, but merely result in its gentle rearrangement into other dynamic distortion patterns. If the colliding particles annihilate, they produce momentary undedicated shrinkage, which can spawn new forms of either matter, or energy, or both. If new particles are created, there is always a residue of undedicated shrinkage which splits (typically) into two oppositely-directed hemispherical shrinkages, producing momentum, or photons, or both.

We Start Simple!

Now, I would like to begin our analysis, by giving the IPP interpretation of **the creation of an electron/positron pair through the merging of oppositely-directed photons**. This choice lets us begin with the simplest creation event, but, even here, we see that *we must deal with a number of complexities:*

- The possibility of differing space lattice orientations relative to the trajectories of the impinging, annihilating photons.
- The possibility of polarization differences, phase differences and age differences in the two photon oscillators at the moment of their coincidence.
- The possibility of unequal photon energies.
- The possibility of photon approach angles other than oppositely-directed.
- The possibility of off-center "hits", or near misses.

Let's begin with the easiest case, photons of equal energy, oppositely-directed:

Photon Production Of Electron/Positron Pairs

Let us assume that we are privileged to watch two *equally* energetic photons meet head-on, using our imaginations as our fermi-resolving ultra microscopes. We will assume that each photon's energy barely exceeds the 0.511 MeV threshold of lepton pair creation, and that all the above complexities are optimized for this electron-positron pair's production. Let's begin by considering some of the mysterious aspects of this creation process which our analysis must deal with, and which we hope to resolve:

Two Mysteries Of Particle Creation

When we seek to understand how colliding photons can create oppositely-charged particles from neutral space, we must confront and resolve two rather baffling mysteries:

1) **Energy must be slowed to produce particles:** Creation of particles involves *localized* rotation of ECEs into a new configuration. This process requires a *static* LD oscillator supported by *spherical* shrinkage, whereas photons have no component of spherical shrinkage, but consists entirely of expanding *hemispherical* shrinkage whose centers move at the speed of light, and which normally pass through each other with no observable interactions. So, *How do two converging photons, consisting of moving hemispherical shrinkage, convert to undedicated spherical shrinkage?*

2) **To survive the creation process, opposite-polarity defects must separate from, rather than move toward, each other:** Oppositely-charged particles are *attracted to each other*, and commonly meet and annihilate each other, whereas creation of particles requires that opposite-charge particles separate against their mutual attraction to a distance sufficiently remote to nullify this attraction. *What causes this separation of mutually attracted particles?* If the separation is due to oppositely-directed momentum attaching to the hovering LD oscillators of the two defects, what process leads to this neat division of the two incoming components of hemispherical shrinkage into two defects & two hovering oscillators, each possessing components of spherical shrinkage, and each possessing oppositely-directed components of momentum supported by *bound* hemispherical shrinkage?

Let's take up these two questions in sequence:

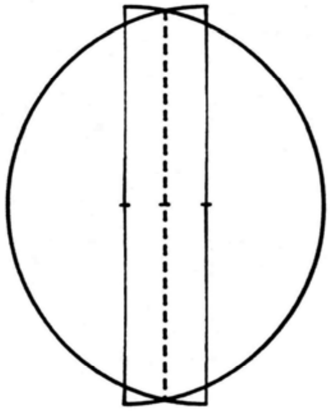
How Merging Photons Create Spherical Shrinkage

The possibility of oppositely directed photons meeting and producing undedicated spherical shrinkage is implicit in the LDT concept of a photon, for we understand that a photon does not move continuously, but, rather, moves in a series of ellipsoidal leaps, like a four-dimensional frog. Periodically the photon's center comes to rest in a skewed pattern of compressive lattice strains, which immediately expands differentially, only to be reflected differentially by the radial "inertia" of the space lattice, in a manner which creates another point of skewed compressive lattice strains displaced one wavelength further in the direction of the photon's trajectory, which, then, provokes another leap, and so *ad infinitum*. Thus, if two oppositely-directed photons of equal energy come to momentary rest in the same lattice location, their patterns of compressive lattice strain will have opposite skew, and will, therefore, sum together into an unskewed pattern of oblate spherical symmetry, *i.e. one of oblate-spherically-shaped undedicated shrinkage*.

Why Interacting Photons Produce Oblate Shrinkage

Here is the reason why this transient undedicated shrinkage is oblate: The *center* of expanding hemispherical shrinkage lies, perhaps, only one-fifth of the way from its point of origin to its hemispherical boundary. Thus, when the centers of two oppositely-directed photons meet, the curved sides of their supporting hemispherical shrinkage have long since moved through each other, so the "trailing" part of each photon's hemispherical shrinkage pattern is overlapped by a portion of each other's "leading" part of the pattern. I show this situation graphically (in cross-section) below:

Fig. 7-1 Pattern Overlap In Merging Photons



At left, the centers of the two solid vertical lines represent the points of origin of the two photons, while the center of the dashed line represents the point of confluence of the centers of the oppositely-directed photons.

The two half circles represent the current outer boundary of each photon's zone of hemispherical shrinkage, while the space between the two solid vertical lines is the region where the two patterns overlap.

The two "**trailing**" portions of hemispherical shrinkage (from the point of origin to the point of confluence of the two photon centers) have axial components of expansion (i.e. those components parallel to the photons' trajectories) which are opposite to, and only slightly greater than, those of the overlapping leading parts, so in these overlap regions the longitudinal components of shrinkage nearly cancel. Thus, the resulting **overlap** shrinkage has a static center, a nearly cylindrical shape, and is expanding radially normal to the trajectories of the merging photons. The "**leading**" portions of hemispherical shrinkage, on the other hand, do not overlap each other. They are, nevertheless, available in the form of undedicated shrinkage to any new phenomena created at the photon annihilation center, simply because they balance each other's expansion.

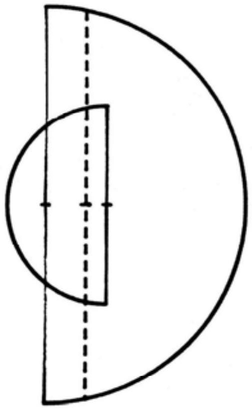
Perceiving The Shape Of This Transient Undedicated Shrinkage

Because the doubled shrinkage of the overlap region is dominantly orthogonal to the photon trajectories, whereas the shrinkage of the two "leading" regions is nearly spherical, we can picture the combined shrinkage as an **oblate spheroid**, with its squashed-in poles in the directions of the photons' trajectories, and its gross equatorial bulge normal to this direction. Its effective undedicated shrinkage cross-section would closely approximately an ellipse, so its shape could also be described as a figure of revolution of this ellipse about its short axis, which is parallel to the photons' trajectories.

Some Preliminaries Before We Discuss Defect Creation

It is well to keep in mind that the undedicated shrinkage *shape* we have described, above, is its *outer boundary*, and depending upon where the photons have been created, its size could vary from millimeters to billions of light-years. And, if the two photons *were* of different ages, this outer boundary shape could have a very different appearance. For example, here is its shape where one photon is half the age of the other:

Fig. 7-2 Overlap In Unequal Age Photons



If the photon energies of the two photons, at left, are equal, and equal to those in Fig. 7-1, the undedicated shrinkage, as viewed from the photon centers, will be identical in all aspects, provided the polarization and phase of the two photon LD oscillators are identical in both situations. We know this is true, because a photon's distortion pattern grows by external accretion of precursor shrinkage, so growth does not require changes in the central photon LD oscillator structure. Therefore, nothing in the particle creation process is affected by the previous history of the two photons. To reflect this irrelevance, we need only change our *perception* of the photon interaction shrinkage; instead of thinking of its *external shape*, let us consider, rather, its *interactive shape*, which, in all cases of equal energy collisions, will conform to the oblate spheroidal shape produced by the oppositely-directed confluence of two *equal-age* photons. This will be true, because the continuous expansion of a photon's (or any other phenomena's) dynamic distortion pattern doesn't alter its central mass-energy density, as I have explained on page 1-3; thus, all photons of the same energy will have identical central patterns, regardless of their age.

The Next Step In The Creation Process

We now have a reasonably good mental image of the *form* of the undedicated shrinkage which is potentially available when two oppositely-directed photons of equal energy meet, but we haven't yet discovered how the merging of two photons produces some *new* phenomenon which utilizes this *latent* undedicated shrinkage. What happens, obviously, is that the confluence of two equally energetic, oppositely-directed photons produces a momentary nubbin of *static* ellipsoidal shrinkage, which can grow only if its induced oscillation produces something, such as an electron/positron pair, that can *utilize*, and, hence, *absorb* the undedicated shrinkage. Otherwise the photons simply pass by each other, and continue on their original trajectories, both unaffected by their brief encounter. Let's see if we can discover a photon interaction scenario which would most likely lead to defect formation:

What Is Necessary For Photons To Produce Lepton Pairs

Since creation of lepton defects requires central rotation of ECEs beyond a "toggle" point, we will have to focus on the dynamic processes at the merging centers of the two photons to understand how pair creation begins. The obvious first question is, "How much energy does it take to rotate central ECEs into a new configuration?"

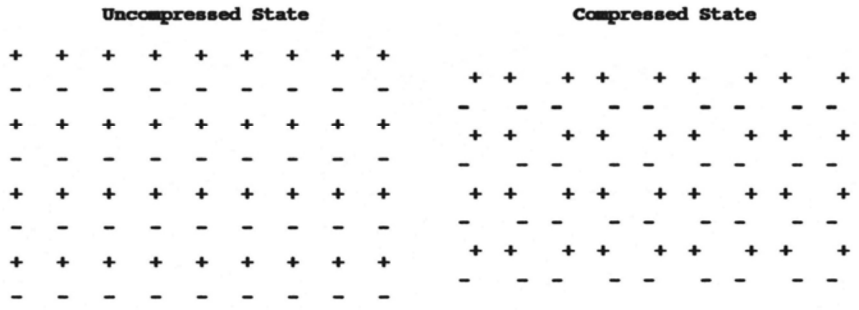
How Much Rotational Energy Is Needed

The answer: *not much!* As long as the two, freshly-created, opposite-polarity leptons are close together, essentially all of their charge fields are canceled. Thus, their requirement for mass-energy (i.e. spherical shrinkage) is very slight. This obvious conclusion has implications for our conception of an energetic photon's center: If only a small fraction of the energy of a 0.511 MeV photon is needed to rotate two ECEs into an contiguous electron/positron configuration, *won't a number of these lepton pairs form each time the photon's center forms*, as it steps through space? *And won't these contiguous pairs of leptons rotate in the reverse direction, and <u>annihilate</u> each other*, as the central ECE density ebbs to provoke the photon's leap to its next center location? This ebb and flow seems a natural consequence of the rotation & counter-rotation of opposite-polarity ECEs at an LD oscillator's center. The direction of rotation clearly reverses at the moment of maximum central compaction, so we conclude that multiple "ghost-pairs" are certain to form, and melt away, in each "landing area", as a 0.511 MeV photon "leaps" through the space lattice. This notion has some interesting ramifications:

What Aspect Of A Photon's Structure Causes Central Rotations?

Answer: *Its in-and-out lattice-density waves.* These waves lead alternately to central compression followed by central decompression. Compression requires making the lattice more *rhombic*, which requires *displacing* opposite-polarity ECEs in each lattice-cube face in orthogonal face-diagonal directions, bringing one polarity of ECE closer together, and the other polarity of ECE further apart. You will perceive that this orthogonal contraction and expansion can be achieved only if the four diagonally-adjacent lattice faces in the same cardinal plane experience opposite directions of compression and expansion. I can illustrate one component of this effect by the schematic below, with a cross-section through a 1,0,1 plane of the space lattice, i.e. one showing lattice face-diagonals in the horizontal direction, and cardinal lattice columns in the vertical directions. The drawing shows the result of applying pressure uniformly to the top & bottom surfaces of a cubical region of the lattice:

Fig. 7-3 Effect Of Compressing Lattice Vertically

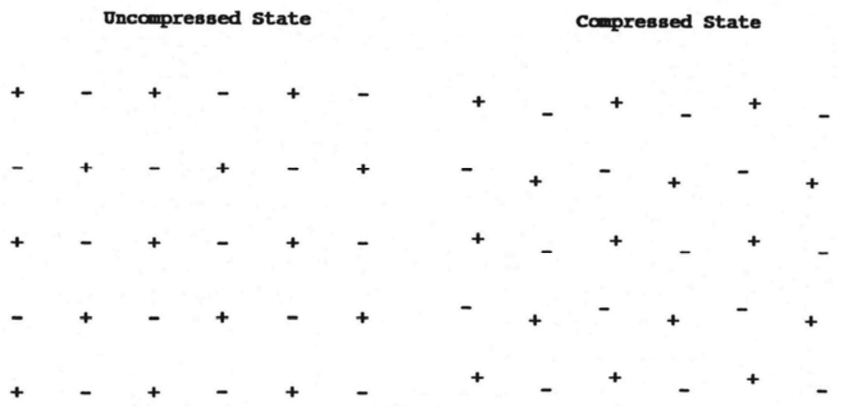


Since we have squeezed the lattice between *square* plates, we have created a three-dimensional distortion pattern. Thus, to get a complete picture, we should try to imagine the configurations of the ECEs in each of the lattice face-diagonals *normal* to the above cross section. Each of these perpendicular rows of ECEs will lie in the same horizontal lattice plane as the rows shown above, and will, of course, consist of ECEs of opposite polarity to those shown, sited midway between each pair of ECEs in each line of the above patterns, with adjacent pairs of these opposite-polarity ECEs displaced equal distances from the lattice-diagonal plane shown.

Now the significant feature of these perpendicular rows is that they will have *narrow* ECE spacings orthogonal to the *wide* gaps in the horizontal rows, and *wide* spacings orthogonal to the *narrow* gaps. Therefore, if we imagine vertical columns of these distorted lattice cubes, we notice that one column will have all the minus ECEs close-spaced, and all plus ECEs wide spaced, while an adjacent column of lattice cubes will be just the reverse, with all plus ECEs close-spaced, and all minus ECEs wide-spaced. This situation obviously results in strong repulsion in the vertical direction, which is just what we would expect when we compress the lattice vertically.

There is a significant geometrical feature which is not readily visualized in the 1,0,1 plane representation of Fig. 7-3: the fact that only half of the cardinal plane "faces" can take on a diamond shape. Let's look at a central *horizontal* cardinal plane normal to both the uncompressed, and the compressed, patterns of Fig. 7-3:

Fig. 7-4 Cardinal Plane Normal To Center Of Fig. 7-3

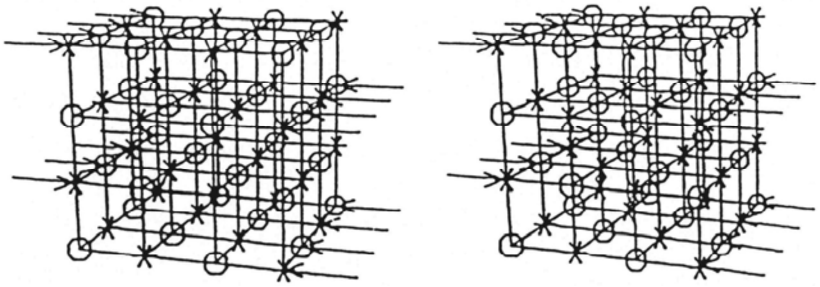


There is one additional significant feature of the "squashed" lattice — *its pattern regularity!* Although we can infer that the *wide* and *narrow* spaces between like-polarity ECEs in any particular face-diagonal row could equally well have formed shifted one ECE to the right or left, we must conclude that this shift would have forced *all the other face-diagonal rows* in the pattern *to conform to this shift!* Thus, we see that the *way* a lattice collapses is subject to the *most subtle initiating influences!* This insight becomes extremely significant, when we perceive that the inwardly-moving ECE density wave of the photon's LD oscillator will manifest six zones of pre-collapsed lattice patterns analogous to Fig. 7-3 (two in each of the three cardinal planes of the lattice). Will these six converging patterns be *pre-synchronized*, or will they merge into a *turbulent tangle?* This leads us to our next question:

How Will This Compressed Space Differ, When The Compression Is Spherical, Rather Than Planar?

Some questions are much easier asked, than answered — this is one! However, a possible route to an answer is to ask another question: *What type of movement of the ECEs could convert a region of the lattice from simple cubic to body-centered cubic?* If we could understand this conversion process, we would at least be able to visualize how a region of the lattice could acquire the maximum degree of compactness. Here's *one* way: Suppose central compression moved alternate central planes *in opposite directions*, as I illustrate in Fig 7-5, below:

Fig. 7-5 Compression Yielding Opposite-Sliding Alternate Planes



If this relative movement of horizontal cardinal planes slid alternate planes inwardly *by half a lattice unit in opposite directions,* it would produce a configuration like that of Fig. 7-6, below. Here, the suggested sliding action would have caused all the vertical columns of ECEs to have the same polarity, thereby producing the unlikely effect that like-charge ECEs would be in direct contact in each vertical column. Since this would create tremendous vertical repulsion between horizontal planes, *it is obvious that this configuration won't form under a condition of uniform spherical compression!* What will happen, instead, is that opposite polarity ECEs will rotate around each other into a more compact form, that of the body-centered cubic lattice, as illustrated in Fig. 7-7:

Fig. 7-6 Stacked Like-Charge Configuration

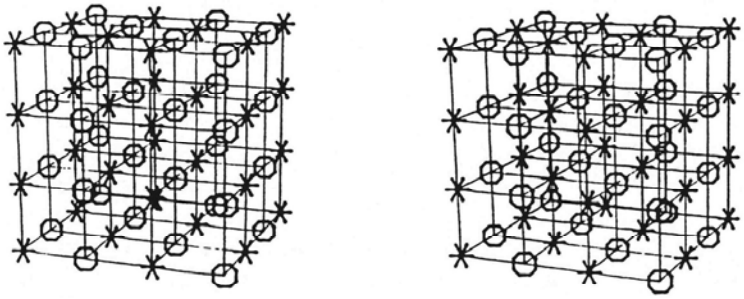
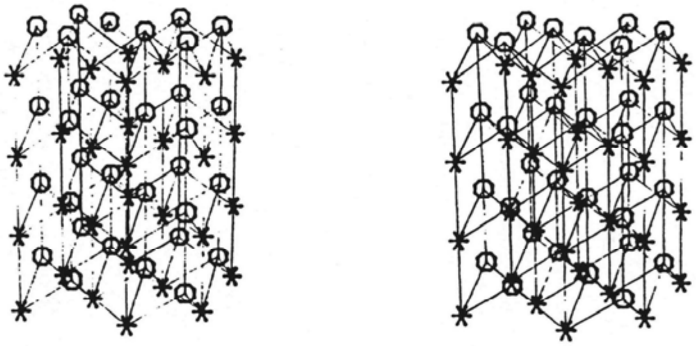
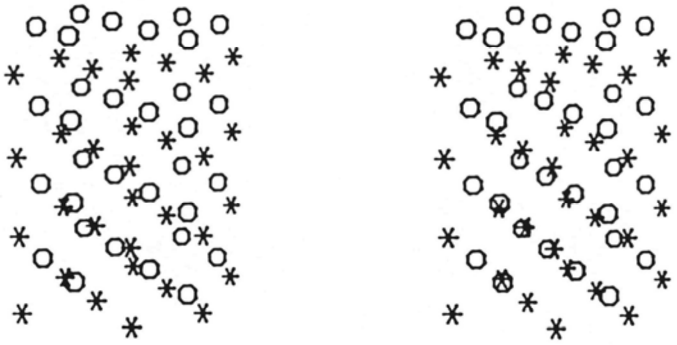


Fig. 7-7 Body-Centered Cubic Lattice Configuration



The charge-displacement aspect of this conversion to body-centered lattice configuration is, perhaps, easier to see when the lines drawn between contacting ECEs are removed, as in Fig. 7-8, below:

Fig. 7-8 Body-Centered Cubic Lattice



Here, we see that the negative ECEs have moved *up* from their location prior to compression, while the positive ECEs have moved *down* a corresponding distance, and the lattice has *expanded* about $\sqrt{2} \times 0.83s$ in the vertical direction, while it has shrunk about 17% in the other two directions. You will perceive that the opposite charge displacement is equally probable; hence, the direction of charge displacement is clearly something that will respond to subtle charge fields already in existence as the central compression builds. What we can, perhaps, infer, is that the *polarity* of the precursor charge-field not only determines the direction of charge displacement, but it will also define the cardinal direction in which the opposite lattice plane movements occur, which are necessary to create this central zone of body-centered cubic lattice.

Things To Notice In Simple-Cubic → Body-Centered Transitions

Besides the need for the lattice to expand in one cardinal direction, here are some other things we should notice in the shift from simple cubic lattice to body-centered:

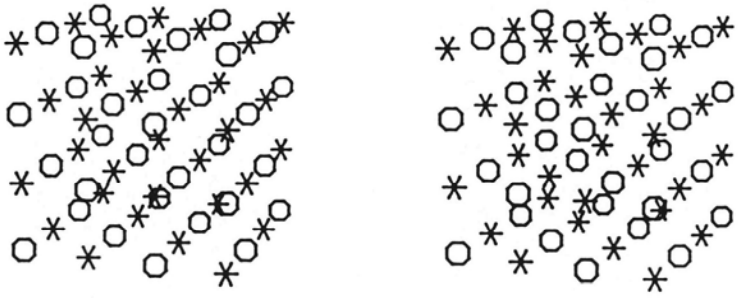
- The cardinal directions of the denser body-centered cubic lattice (**BCCL**) have shifted by 45 degrees from those of the precursor simple cubic lattice (**SCL**) of Fig. 7-9, next page.

- The cardinal planes of BCCL consist of only one polarity of ECEs, whereas the continuation of these planes in SCL (its face-diagonal planes) consist of single-"charge" threads in, say, the xz directions, but which alternate polarities in the xy & zy directions.

- The like-"charge" ECEs are closer together in BCCL.

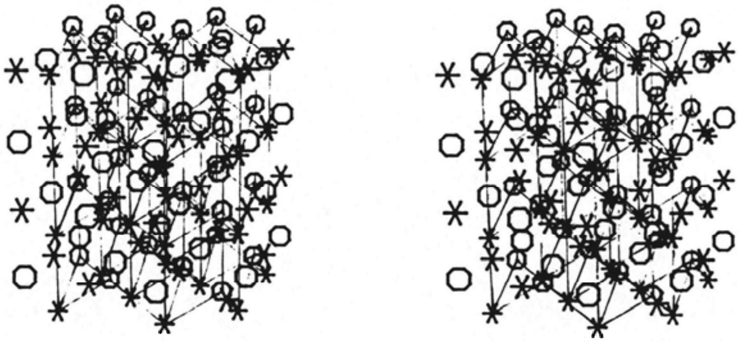
- Each ECE in BCCL contacts eight opposite-charge ECEs, whereas in SCL each ECE contacts only six.

Fig. 7-9 Simple Cubic Lattice



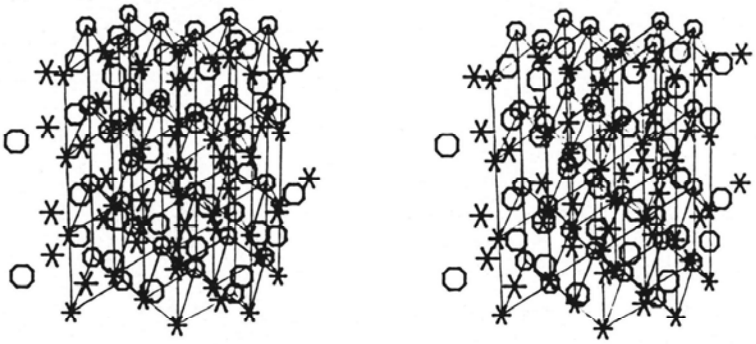
Now, let us consider the mechanics of this conversion from SCL to BCCL. It is immediately obvious that the necessary ECE rotations must deviate from the face-diagonal directions utilized in electron/positron creation, but nothing else about the process is obvious. To appreciate the difficulty of picturing the requisite twisting & turning of the ECEs involved, let us look at the before and after configurations superimposed upon each other. I show this in three stages, beginning with Fig. 7-10:

Fig. 7-10 BCCL Superimposed Upon Precursor SCL



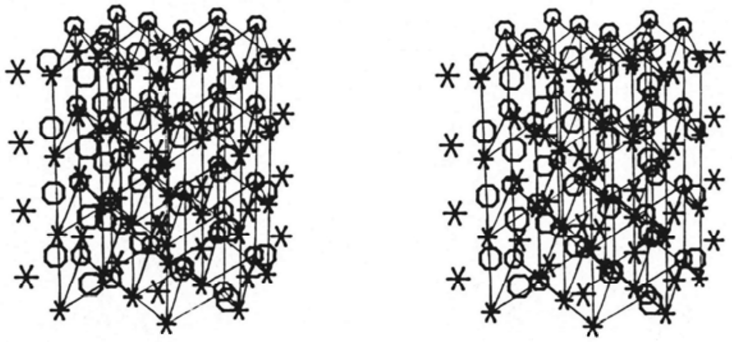
Here, we see a number of precursor ECEs suggestively close to their presumed BCCL locations; yet an equal number seem to be far removed, and nearly equally spaced from two possible BCCL sites. This ambiguity is lessened, when we displace alternate planes of the SCL ±0.25s in the x-directions in Fig 13-11, below:

Fig. 7-11 BCCL Superimposed Upon Half-Displaced SCL



This half-displaced arrangement of SCL's ECEs seems to yield more plausible ECE translocations, but there are still regions of ambiguity, where opposite-polarity ECEs are close together in the two patterns. We should expect translocation distances to change as a function of distance from the centers of the two patterns, because the like-polarity ECE are 15% closer together in BCCL. Now, let's look at the translocation distances in the fully displaced SCL:

Fig 7-12 BCCL Superimposed Upon Fully Displaced SCL



Here, because the arrangement of ECES in both patterns is the same in all the vertical columns, the "morphing" from SCL to BCCL merely requires all the ECEs in each column to separate to the like-charge spacings of BCCL, and for opposite-charge columns to move ¼ of this spacing in opposite directions vertically. This movement permits the contacting opposite-charge ECEs to rotate into a more compact grouping in the x & z directions to form the BCCL structure. In this transition, the translocation distances are short, and their directions of movement are readily apparent in the superimposed patterns, above.

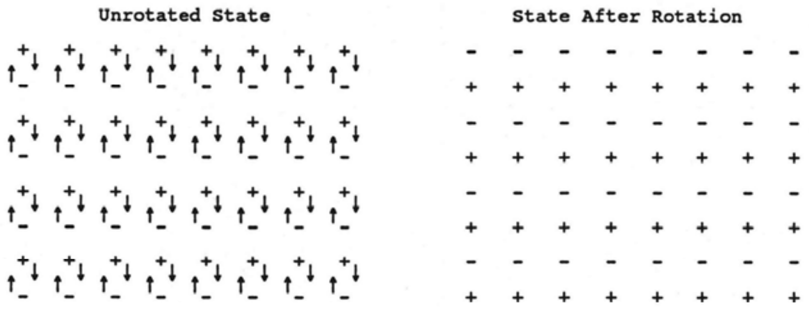
Is Uni-Axial Expansion Necessary In BCCL Formation?

What completely surprised me, in making this graphical analysis, was the necessity for *expansion* in one of the three cardinal directions, in order for shrinkage to occur in the other two. I had previously considered that the lattice would merely shrink in all three directions to form the BCCL. Could I have just had the bad luck to choose the wrong kinds of ECE movements to effect this transition? Was I wrong to presume that alternate xz cardinal planes would have to move ½s in opposite x (or z) directions to set up the necessary conditions for transmogrification? Is there some other way to intuit this process?

What If ECE Rotations Affect Only Alternate Face-Diagonal Planes?

When we look at the simple-cubic lattice, we notice that face-diagonal directions consist of ECEs of the same polarity, but that adjacent diagonal lines of ECEs in any cardinal plane alternate in polarity, as do these diagonal line immediately above and below any particular line. Hence, if we postulate some plus-minus ECE rotation process which affects only alternate face-diagonal planes, the result would be to establish a stack of cardinal planes consisting of *only one polarity of ECEs*, with these polarities alternating down through the stack. This configuration is close to the arrangement of ECEs in the body-centered cubic lattice; all that is required to complete the conversion would be for alternate cardinal planes to slide relative to each other, so as to cause the ECEs of each plane to site above and below the *centers of the lattice-faces* of adjacent opposite-polarity planes. I show the ECE rotations (in the y-direction of an xz plane) needed to produce cardinal planes consisting of only one polarity of ECE, in Fig. 7-15, below. To visualize the 3-D effect after rotation, recall that the 1.0.1 planes in front of, and behind the rotated state will be unrotated, and will have opposite ECE polarities to the unrotated state shown below:

Fig. 7-13 Face-Diagonal Rotations Yielding BCCL



We should perceive that the above rotations won't take the simple pathways that I have indicated, but, rather, that rotating, plane-shifting, and ECE-density increasing will be occurring simultaneously. We can infer that it might be this simultaneous action which prevents the rotation of the adjacent (alternate) 1,0,1 planes (which, if this occurred, would merely produce an inverted form of the simple-cubic lattice, and *this* couldn't be a result of initiating rotation by central *lattice contraction*).

Now, using these fuzzy concepts, let us explore how colliding ghost-pair plasmas might convert into an electron-positron pair:

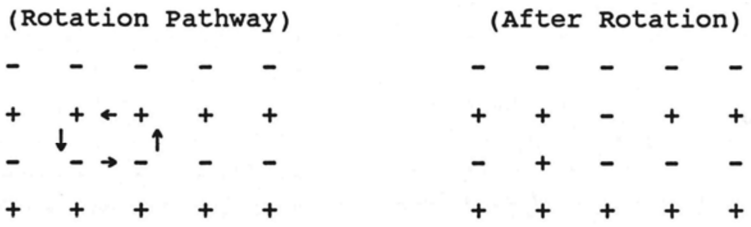
How Collision Shrinkage Is Allocated

When lepton-pair creation occurs, the hemispherical shrinkage implicit in the *momentum* of the colliding photon's myriads of ghost-pairs becomes available as undedicated shrinkage, since equal numbers of these ghost-pairs have oppositely-directed momentum. Some of this undedicated ellipsoidal shrinkage is consumed in forming the charge-displacement patterns of the two replacement defects and their two hovering oscillators, whereas the rest of the undedicated shrinkage splits to form two *bound* photons, whose attachment to the two hovering oscillators is manifest as increased oscillator ellipticity. We will see that the displaced centers of the static ellipsoidal LD oscillator play a vital role in this scenario, as does the orientation of these centers relative to the space lattice. Let's try to visualize the individual steps of this creation process:

Some Details Of Electron/Positron Pair Production

To produce a electron/positron pair, a ring of at least four ECEs must be made to rotate around each other in a face-diagonal plane of the lattice, past a "toggle" point of local hexagonal close-packing, and subsequently into a condition of higher local ECE density in which the "centered" patterns of the two replacement defects form. I show this scenario in Fig. 7-14, below:

Fig. 7-14 Creating An Electron/Positron Pair?



Here is why we should question this scenario: Although the rotation of these four ECEs clearly produces two opposite-polarity replacement defects, *they are very close together*, being just a lattice cube-diagonal apart, and are *still very tightly bound together*. There would seem to be no way that these two defects could form individual hovering oscillators, nor cause the remaining undedicated shrinkage to split into two zones of hemispherical shrinkage, let alone allow each zone to center itself on their respective hovering oscillators to produce the ellipsoidal shape necessary for separating these opposite-polarity defects against their mutual attraction.

So what *could* happen to avoid these obstacles? What is necessary, of course, is *for more ECEs to participate in the rotation process,* so that the two leptons form further away from each other.

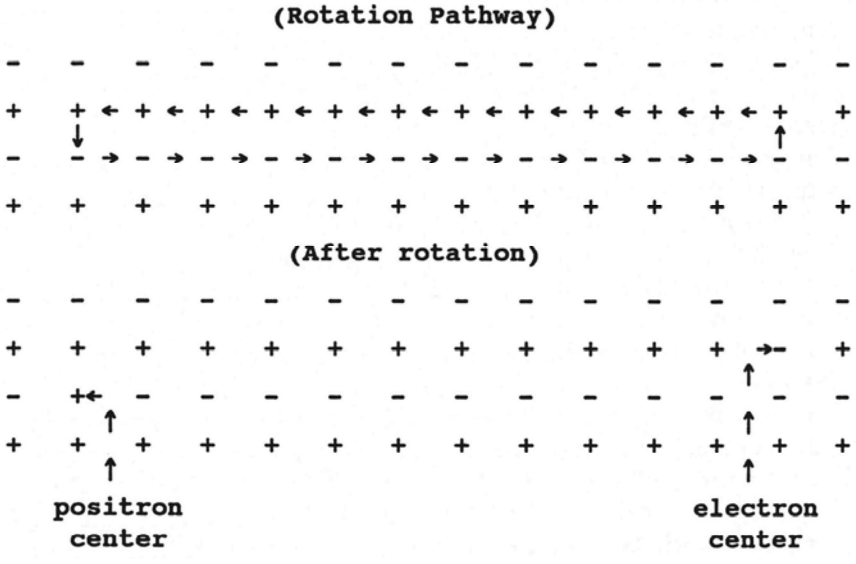
What Could Cause This Larger Exchange Loop?

Here is where both the *energy* of the colliding photons, *and* their *relative polarizations* comes into play. From IPP's perspective, a photon's pulsating lattice-distortion pattern rotates & counter-rotates its central ECEs at each touch-down point along its trajectory. The axis of this rotation lies parallel to a photon's trajectory, but its neutral plane can take any angle relative to the cardinal axes of the space lattice. At low photon energies, these central opposite-polarity ECEs rotate only partially around, so their effect is to produce a *radial* charge displacement pattern *normal* to the trajectory, which, in spreading outwardly, develops a pulsating electrostatic field whose *maximum gradient takes a specific direction* normal to the photon's trajectory. This pulsating field of specific orientation is IPP's concept of **photon polarization**.

However, *when the colliding photons have sufficient energy to produce a lepton pair*, we must alter our mental image of each photon's structure. Now, the central compression at each touch-down point is capable of forming numerous counter-rotating ECE loops, as I illustrated in Fig. 7-13. We can infer that these opposing central rotations, while producing considerable central stress & strain, leave the central region free of charge gradients. Instead, these charge gradients can form only at larger radial distances from the touch-down point, where the pattern shrinkage is insufficient to produce total rotations of the local ECEs.

Something that appeals to me is to imagine that, during the waning of central density, threads of same direction of reverse rotations could form two chain-like sequences of ECE exchanges that connect points of rotation on opposite sides of the center of undedicated shrinkage, causing pair-creation like that shown in Fig. 7-15:

Fig. 7-15 A More Plausible Pair-Creation Scenario?

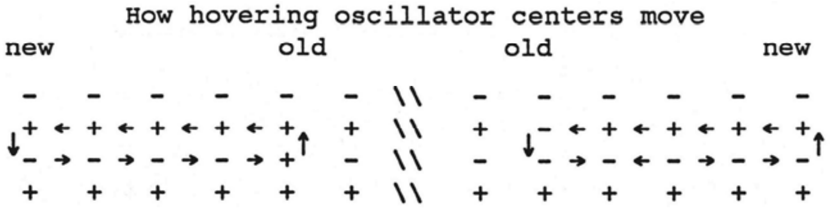


These oppositely-directed, face-diagonal shifts of columns of like-polarity ECEs should look familiar to you — they are similar to the opposite-polarity void oscillations of electron neutrinos, except that no voids are involved, and the electrostatic gradient initiating the exchange is provided by the alternating field of the two photon oscillators, rather than by the strong fields of opposite-polarity void defects. Hence, if very little mass-energy is attributed to electron neutrinos, it's clear that the degree of separation of the two defect centers in pair formation should have very little effect on the mass-energy required for their formation.

Separation Of Void-Pair Centers Causes Shrinkage To Split

A larger exchange loop during pair formation provides two separated centers of phenomena. Although these centers initially have very little mass, they nevertheless provide something that proto-photons can bind to, and this is all that is required to cause the undedicated shrinkage to split into two hemispherical zones, and cause the two proto-photons to become highly elliptical hovering oscillators bound to the electron and to the positron. You will see that the hovering oscillators must be highly elliptical, because almost none of the creation mass energy is used in producing charge fields initially, so the preponderance of the undedicated shrinkage takes the form of oppositely-directed momentum. It is this preponderance of momentum which separates the lepton pair against their mutual attraction. We should expect this separation to be effected by huge leaps through the lattice at each hovering oscillator cycle, taking the form of oppositely-directed charge-exchange loops, as in Fig 7-16:

Fig. 7-16 How Lepton Pairs Overcome Mutual Attraction



Clearly, these loops, initially, must span one wavelength of a 511 KeV photon (wavelength ≈ 6.33×10^{-13} meters ≈ 633 fermi ≈ 3520 ü), which is several thousand lattice units. These leaps will diminish as the leptons separate, and momentum converts into increasing electrostatic field, until at mutual escape distance, the leptons will merely hover back-and-forth between adjacent defect sites.

Creating Hadron Particles (Defect-Pair Clusters)

A Puzzle We Need To Solve

Colliding relativistic electron & positrons usually create hadron particles, *yet relativistic mass-energy is not in the form of c-voids or defect-pairs!* How are c-voids formed in these collisions?

IPP asserts that relativistic particles are massive because they are accompanied by *clouds of "ghost-pairs"* (momentary half-formed electron/positron pairs), with each ghost-pair absorbing an equal portion of the *relativistic* mass-energy in the form of a ellipsoidal lattice-density oscillator. These ghost pair oscillators are presumed to have the same ellipticity as the core defects (electron & positron), so the whole assembly moves as a cohesive unit through space.

So, although IPP's concept of relativistic particles shows us how their masses can increase without limit, it leaves us with this question: *Why & how do annihilated ghost-pairs transmute to c-void defect-pairs?*

Understanding How Ghost-Pairs Convert To Defect-Pairs

Our first gestalt should be that the annihilation of the two impinging leptons has not produced a defect-free lattice! Rather, the undedicated shrinkage created by the mutual annihilations will still be producing a large number of ghost-pairs per MeV of its mass-energy. What we should imagine is a multiplicity of phase-locked LD oscillators, all of the same frequency and energy, each oscillator centered upon one of the ghost-pair sites, with the integrated shrinkage of entire assembly of these oscillators summing to the undedicated shrinkage produced in the annihilation. The oscillators will be phase-locked, because each ghost-pair center has identical mass, and all centers share equally in the undedicated and dynamic shrinkage.

Of course, it boggles our minds to attempt to imagine the geometry of a neutral plasma of tens of thousands (or millions) of oppositely-directed ellipsoidal LD oscillators each centered upon a ghost-pair. The presumption that each of these oscillators has the same frequency let's us infer that oppositely-directed oscillators will tend to join into a static oscillator of twice the mass-energy, producing even more ghost-pairs. But surely the tendency will be for local chaos to occur. Thus, it seems reasonable to assume that local conditions will exist favorable for the formation of *voids* and *excesses*, along with sufficient undedicated shrinkage for some of these to collapse into c-voids, and for some of these to find partners, i.e. to sort themselves out into defect-pairs. (Obviously, when the undedicated shrinkage is converted to defect-pairs, the complexity of the annihilation plasma diminishes, greatly reducing the numbers of remaining ghost-pairs).

How Defect-Pairs Jockey For Positions After They Form

- Any defect-pair formed will quickly move toward the center of undedicated shrinkage by diagonal and cardinal translations, thereby expanding its spacing to assimilate as much undedicated shrinkage as is available to it in competition with other defect-pairs simultaneously forming in the same or in other cardinal directions of the space lattice. In this jockeying for position, a number of secondary processes may come into play:

- Orientations between adjacent defect-pairs may be stabilized by paraxial or diagonal bonds, or by geometries suitable for charge-exchanges.

- Defect-pairs, which acquire very large defect spacings, may spawn a central pair of defects along the existing pairing-axis, thereby forming a paraxially-bonded defect-pair duo.
- And finally, the geometry of the emerging cluster of defect-pairs will tend to become regularized by defect spacing adjustments in the cluster's sub-groups so that the cluster's shrinkage pattern most closely emulates the pattern of undedicated shrinkage formed in the annihilation.

About Symmetry & Asymmetry In The Clustering Process

The above defect-pair clustering processes can yield quite symmetrical arrangements, like the psi particles, some of the time, but, because these regularizing tendencies begin always in an ambience of chaos, a multiplicity of outcomes must always be expected. Occasionally the sorting out process may be complicated by the opportunistic arrival of *voids* or *void*-pairs, which can cause a centrally located ghost-pair to separate sufficient to allow the two substitution defects to convert all, or most of the undedicated shrinkage into momentum, thereby terminating the rearranging process by the expulsion of an electron/positron pair, sometimes in combination with a gamma.

The Effects Of Adjusting Collision Energy

The formation of narrow resonances: It should be evident that the probability of a certain outcome, like the formation of a J/psi particle, can be enhanced by providing just the required amount of undedicated shrinkage in the annihilation. This follows, because the regularization processes will lead to a symmetrical structure only if the unassimilated residue of undedicated shrinkage is too small either to produce another defect-pair, or to increase the spacing of one of the existing defect-pairs by 2s. And, because a symmetrical structure fits neatly into the zone of undedicated shrinkage, the regularization processes are far more likely to produce it than some other less symmetrical structure of the same mass. This neat fit accounts for the observed very narrow resonance of the J/psi. Not only does it tend to form to the exclusion of other possible structures, but the small residue of undedicated shrinkage after its formation limits the amount of energy available for its fractionation into subparticles.

The broader resonances: Resonances which are broader, conversely, will be structures which are poorer fits to the zone of undedicated shrinkage. With less symmetry, a defect-pair cluster will not be able to utilize all the available undedicated shrinkage, so it will not form when the undedicated shrinkage equals its mass. And, when it *can* form, at higher undedicated shrinkage, there will always be larger unutilized residues of shrinkage to contribute to its fractionation. Thus, its lifetime will be shortened.

Concerning The Interaction Of Photons With Nucleons

One common scenario for creating defect-pairs is for a thermal electron neutrino (neutral "void-pair") to course through undedicated shrinkage, produced when a high-energy photon (>136 MeV) interacts with a nucleon. In the presence of this substantial undedicated mass-energy, the two defects will collapse, and thereby lose almost all of their velocity relative to the center of shrinkage. This follows, since their approaching momentum was based on a neutrino mass value much less than 1 milli-eV (see calculation on page 8-10, next chapter), whereas, in collapsing, each void will increase its mass to 136/2 MeV, i.e. by a factor of 10^{11} or more.

Since the two opposite-polarity voids of the void-pair are continuously oscillating back and forth about their common center, they will tend to absorb equal fractions of the undedicated shrinkage, as they transform themselves from void to c-void. But, even though their speeds relative to the space lattice have been greatly reduced, they will still continue to move away and toward each other. Sooner or later, the pair will arrive at an alignment permitting pairing, with mutual cancellation of a their absorbed shrinkage. This, of course, cannot be interpreted to mean that shrinkage will disappear, but, rather, that the two defects will rearrange at a pair separation yielding a mass value commensurate with the existing shrinkage.

We shall want to try to understand what will happen as the c-void defect-pair leaves the site of its creation, but, first, let us try to imagine another creation possibility. Since any center of shrinkage, or energy, will contain electrostatic displacements, we can imagine electrostatic fields of sufficient intensity to dislocate an ECE from its lattice position, producing a void-excess pair. We can assume that the shrinkage necessary to create this pair is less than that required to sustain the least massive defect-pair, as this combination is simply a half-neutrino plus a muon, and there are no known hadrons lighter than this combination. If the local shrinkage is more than sufficient to produce this duo, we can anticipate a ballet of rearrangement between these newly created particles.

At first thought, it might seem that the extreme mass disparity of the void and the excess would prevent their pairing, since the lighter particle might be expected to zoom off at the speed of light. But this objection is not valid, because the void would instantly rearrange in the presence of excess shrinkage to balance the mass of the excess. And, in turn, the contraction and expansion zones of the single c-void defect could induce the rearrangement of the excess into a paired configuration. Of course, this rearrangement may not always happen; it is only one of a number of possibilities. The dynamics of these creation and rearranging processes are complex; their unraveling will take much time, and many minds.

An Example — Photon-Production Of A Pion

Let us take, as an example of defect-pair creation, a familiar particle experiment, the photon-production of a pion by bombarding protons with gamma photons. Here, the reaction products are a charged, or neutral pion, plus a neutron or proton. The probability of producing a pion is not a smooth function of the photon energy, but fluctuates in a series of broad peaks, called resonances. These resonances attest to the formation of momentary discrete structures, which almost instantly break apart into a nucleon and pion.

The interpretation of this in Infinite Particle Physics is that the momentary coincidence of the photon, and the three defect-pairs representing the proton, generates sufficient undedicated shrinkage (in the form of a spherical LD oscillation) to "fracture" the space lattice, producing void-excess pairs, one of which rearranges into a neutral defect-pair by the second process described above. If the collision produces any excess shrinkage beyond that required to create the new defect-pair, we shall imagine that this shrinkage will split into two equal zones of hemispherical shrinkage, which are captured by the proton & neutral pion in the form of separation momentum. Sometimes the outcome is a neutron and charged pion. This outcome can result from a charge-exchange between proton and pion before they separate.

Using these concepts for defect-pair formation and clustering, you should be able to visualize the creation processes unfolding in most creation experiments. However, the Nobel Prize recognition of the discovery of W and Z particles needs our attention, since these particles have no reasonable defect-cluster structures in the IPP.

W & Z Particles

The experimental evidence for these particles is found in very high-energy proton-antiproton annihilations. What is seen as evidence of a charged W particle is the extremely rare occurrence, among other decay products, of either a lone electron, or muon, with very large transverse momentum, along with an equal amount of missing momentum, which can be attributed to a neutrino, coproduced with the charged lepton. Similarly, the evidence for the neutral Z particle is the rare occurrence of a lepton pair with high transverse momentum among the other decay products. Mass values have been obtained for these particles in the usual way from cross section maxima. Z mass value have been confirmed and refined by electron-positron annihilations at both CERN and SLAC; however, the energies available at these two facilities are not yet sufficient to produce an opposite-charge pair of W's. LBL 1994 mass values are: W = 80.22 ± 0.26 MeV, Z = 91.187 ± 0.007 GeV.

IPP's Explanation Of W's & Z's

In IPP I explain the weak interactions as simply charge-exchanges between collapsed defects and proximate neutrinos, so there is no need to postulate an exchange particle to mediate these transactions. Thus, although the W's (and Z's) are seen as confirmation of the weak-interaction aspect QCD, they suggest an entirely different phenomenon in IPP — the energy required to produce the smallest possible charged (or neutral) "black-hole".

For example, we could interpret the energy threshold of the Z^0 as simply the amount of shrinkage required to convert the central collision zone into the minimum quasi-stable volume of neutral body-centered cubic lattice. If this conversion "soaked up" all the available collision energy, it would prevent the collapse of defects produced by the wake of ghost-pairs which accompany the impinging leptons, thereby leading, instead, to a single transient structure, rather than to the multiplicity of hadrons produced at slightly lower energies. Thus, the evolution of high transverse momenta lepton pairs, identified as a Z^0 decay, could be just the manifestation of the devolution of a transient body-centered lattice region into the normal cubic lattice structure. We should note that this lattice structural reversion could be the microcosmic mechanism of the radiation decay of "black holes" postulated by Stephen Hawking.

The Structures Of W's & Z's Elude Your Author

I have not yet been able to imagine plausible structures for these particles, but other minds will discover them! The accurate mass value of the Z^0 gives good evidence that a unique configuration exists momentarily in the space lattice for it, although the small percentage of lepton/anti-lepton decays (about 3.37% for each of the three lepton varieties) suggests that the most symmetrical configuration is difficult to develop. The equal number of tau's to muon's and electron's does cast suspicion on my proposed structure for the tau, although the large numbers of $B/\overline{B}$'s (15.45%) in the 69.90% hadron decays shows that complex structures are commonly formed in the Z's devolution, so the eight defect-pairs required for a pair of tau's is at least plausible.

The lower mass of the W's suggests that a charged region of body-centered cubic lattice makes a smoother transition into the surrounding simple cubic lattice than does a neutral region.

Now, let's escape from this unresolved problem to the next chapter, where I show you how an ether universe may have evolved.