$\frac{d\psi}{dt} = a$, **therefore** $\psi = at$ (Angular displacement in radians).

Then, further, we rotate this compounded vibration & rotation about the Y axis at a constant rotational speed of 0 or 1.

$\frac{d\phi}{dt} = b$, **therefore** $\phi = bt$ (Angular displacement in radians).

Now, this V.U., already doubly rotated, is further rotated about the Z axis at a constant vibrational speed of -1, 0 or 1.

$\frac{d\theta}{dt} = c$, **therefore** $\theta = ct$ (Angular displacement in radians).

In order to find the equations to describe these projections, there is the method of multiplying matrices at length, or to use a computer program, such as Derive™, Derive XM™ or Derive for Windows™, which multiplies matrices, handles symbolic algebra and trigonometry readily, and plots both plane curves and space curves.

Since the reader may want to plot the curves on a computer, but either cannot, or does not wish to, multiply matrices, I shall include the results below.

However in this paper the purpose is to rotate this vibration about the three axes in the following order:-

1) About the X axis to generate a plane curve contained within a circle in the ZY plane.
2) Then this is rotated about the Y axis, (magnetic axis), to generate a space curve contained within a spherical or ellipsoidal shell within the Euclidean 3-space defined by the X, Y and Z axes.
3) Then this space curve is rotated about the Z axis, (electric axis), giving meaning to the full triplet for each subatom.

In the case of atoms after hydrogen, we have, **allegedly**, two concentric orthogonal vibrations being rotated in like manner to the above description, however the order of rotations differs due to the axis of vibration of the second photon being orthogonal to that of the first photon. This is the interpretation of Dewey Larson, however **it may be flawed**. (See below, Duplons/Biphotons)

TWO CONCENTRIC VIBRATING PHOTONS (Larsonian deduction)

Revised stratagem for plotting the projections of the space curve.

Let the original vibration be along the Y axis for the first vibrating unit and along the X axis for the second concentric vibrating unit.

Let the rotation matrices be A, B & C for revolving around the X, Y & Z axes resp.. Replace each angle of rotation, α (alpha), β (beta) & γ (gamma) with at, bt and ct, resp., thereby converting each rotation matrix to a spin matrix, dependent on time.

$$\mathbf{A} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos at & -\sin at \\ 0 & \sin at & \cos at \end{bmatrix} \quad \mathbf{B} = \begin{bmatrix} \cos bt & 0 & \sin bt \\ 0 & 1 & 0 \\ -\sin bt & 0 & \cos bt \end{bmatrix} \quad \mathbf{C} = \begin{bmatrix} \cos ct & -\sin ct & 0 \\ \sin ct & \cos ct & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Firstly the vibration is a one-dimensional path represented in a parametric form y = V(t) and x = V(t) for the two `*parts*' of the atom resp., so each must be expressed as a column vector:-
Vibe1 = $[0, V(t), 0]^T$ and Vibe2 = $[V(t),0,0]^T$ resp..

The order of the rotations of the first unit are about the X axis first, then the Y axis then the Z axis, hence:-

C.B.A.Vibe1 is the vector of three elements, [v1,v2,v3], which represents the space curve traced by the first vibrating centre-point within the spherical shell of radius 1/2,

$$\mathbf{C.B.A} = \begin{bmatrix} \cos bt.\cos ct & -\cos at.\sin ct + \sin at.\sin bt.\cos ct & \sin at.\sin ct + \cos at.\sin bt.\cos ct \\ \cos bt.\sin ct & \cos at.\cos ct + \sin at.\sin bt.\sin ct & -\sin at.\cos ct + \cos at.\sin bt.\sin ct \\ -\sin bt & \sin at.\cos bt. & \cos at.\cos bt \end{bmatrix}$$

and for the second unit the order is about the Y axis first, then the X axis, then the Z axis, hence:-

C.A.B.Vibe2 is the vector of three elements, [v4,v5,v6], which represents the space curve traced by the second vibrating centre-point within the spherical shell of radius 1/2.

$$\mathbf{C.A.B} = \begin{bmatrix} \cos bt.\cos ct & -coaat.\sin ct & \sin bt.\cos ct + \sin at.\cos bt.\sin ct \\ -\sin at.\sin bt.\sin ct & & \\ \sin at.\sin bt.\cos ct + \cos bt.\sin ct & \cos at.\cos ct & -\sin at.\cos bt.\cos ct + \sin bt.\sin ct \\ -\cos at.\sin bt & \sin at & \cos at.\cos bt \end{bmatrix}$$

$$\mathbf{C.B.A.Vibe1} = \mathbf{V}.\begin{bmatrix} \sin at.\sin bt.\cos ct & \cos at.\cos ct & \\ -\cos at.\sin ct & , +\sin at.\sin bt.\sin ct & , \sin at.\cos bt \end{bmatrix} = \left[\mathbf{V_1}, \mathbf{V_2}, \mathbf{V_3}\right]$$

$$\mathbf{C.A.B.Vibe2} = \mathbf{V}.\begin{bmatrix} \cos bt.\cos ct & \sin at.\sin bt.\cos ct & \\ -\sin at.\sin bt.\sin ct & , +\cos bt.\sin ct & , -\cos at.\sin bt \end{bmatrix} = \left[\mathbf{V_4}, \mathbf{V_5}, \mathbf{V_6}\right]$$

In addition to trying to represent the 3-D space curve on a plane, it may be more informative to project it onto the three orthogonal planes so we need a matrix made up from:-

1) Three vectors for the subatomic particles and hydrogen to be able to trace all three projections,

and

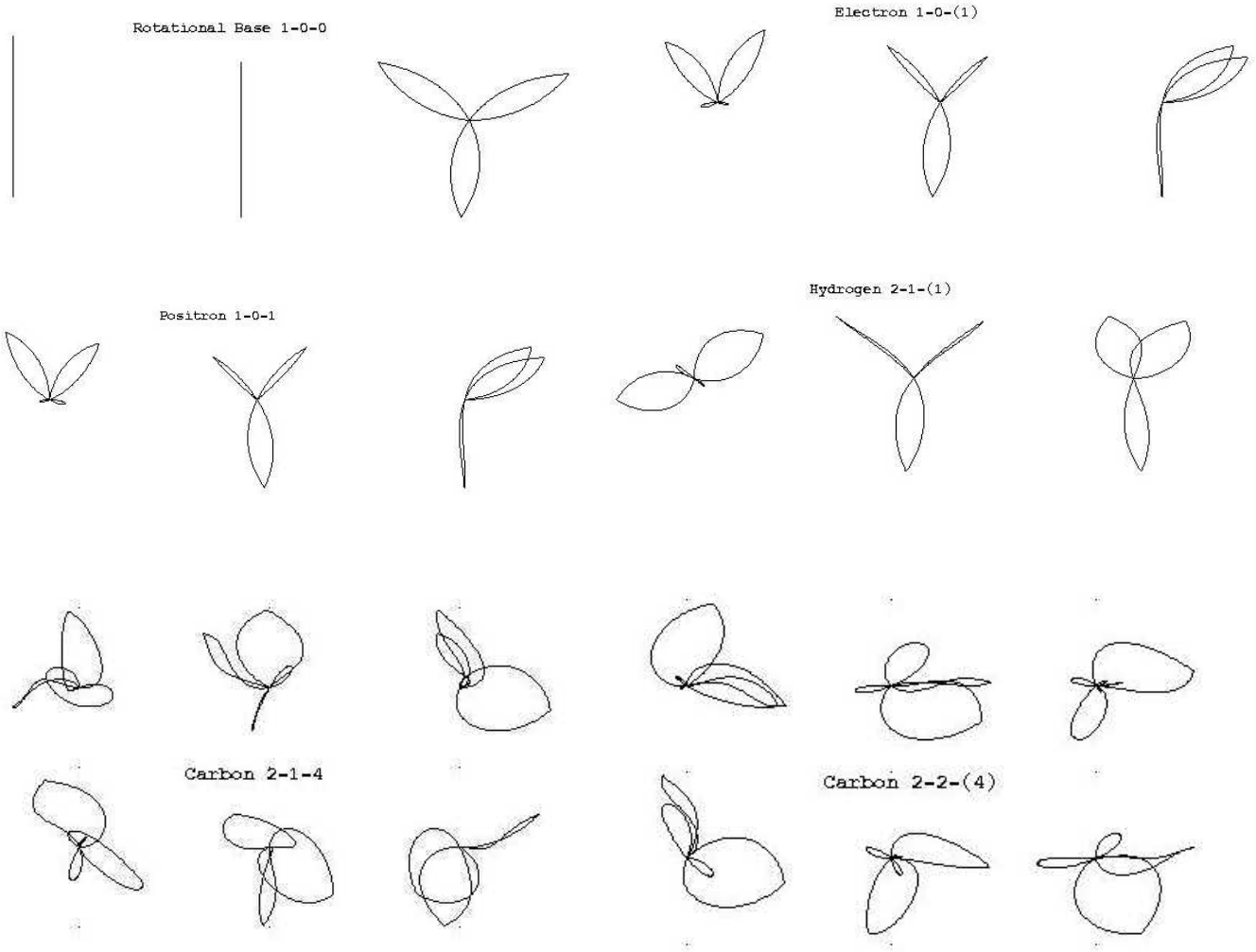
2) Six vectors for the rest of the atoms to be able to trace all six projections within the one plotting window.

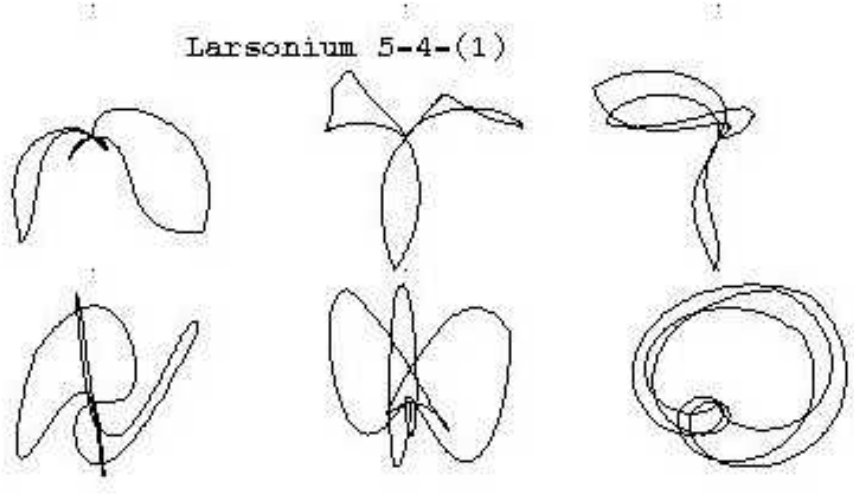
$$\begin{bmatrix} V_1 - p & V_2 + q \\ V_1 & V_3 + q \\ V_2 + p & V_3 + q \end{bmatrix} \qquad \begin{bmatrix} V_1 - p & V_2 + q \\ V_1 & V_3 + q \\ V_2 + p & V_3 + q \\ V_4 - p & V_5 - q \\ V_4 & V_6 - q \\ V_5 + p & V_6 - q \end{bmatrix}$$

It is well-known by any mathematician, when studying uniform circular motion, that the path of a point, that traces a circle about the origin, can be considered as an example of Simple Harmonic Motion (SHM) when projected onto either the X axis or Y axis. However, in the case of the Larsonian oscillation of a space unit, there is no rotation, let alone a fictitious *`birotation'*. To consider this *`birotation'* is repudiating, (if not recanting), the very postulates, which define RST.

Refer Larson's paper:-

"A Rejoinder to KVK Nehru" Reciprocity Volume XII, Number 3 in 1983





POETIC LICENTIOUSNESS-8

VIEW FROM A POINT

Take thou a space unit, and vibrate it freely,
Then maybe you-all have a straight line, nearly.
The difference twixt two is forever eternal,
It's as obvious as night and day is diurnal.
Each photon/duplon/triplon merely describes its own locus,
To aver it a line is Hocus-Pocus.
So when we rotate it, to build up a particle,
There is no surface, (as you'll see by my article).
The successive rotations may be called revolution,
And all these revs. determine `*The Atom's Evolution*'.
The space-curve, thereby formed, has properties, Intrinsic,
Brought about by these combined vibes and revs, Extrinsic.
The triplets, that describe this photon's dance,
May seem to suffice
To identify which atom/particle,
In a manner precise.
However, for completeness, we need one more:-
The vibration's `*Omega*', comes to the fore.
This gives us energy, as well; we could call it *"State"*,
Since arc-length and frequency are both connected with rate.
This new basis rivals Quantum Theory,
To deny all this, is rather dreary.
So let I.S.U.S. proceed with this new innovation,
And develop it to fruition, (and resist recantation).
Now remember, the kernel is 2 or 1 photon,
To deny this foundation is strictly `*verboten*'.

(This poem was written at a time when I accepted SHM for the photon)

BIPHOTONS AND TRIPHOTONS

ALTERNATIVE DEDUCTION FROM POSTULATES [without assumption(s)]

RST RECAP

Dewey Larson's philosophy was that if the postulates were assumed to be correct, then any deduction therefrom was mandatory and had to be given serious consideration, even if validation was not immediately available.

He deduced the existence of highly energetic stellar bodies despite their seeming improbability to legacy physicists/astronomers. Nevertheless he published his predictions in 1959 and about 2 years later, Quasars and Pulsars were discovered.

This writer has reasoned from these same postulates another line of deductions pertaining to subatoms and/or atoms, which **seem** to have been overlooked by Dewey Larson. Maybe the postulates will enable this to be invalidated, however I place that in the hands of others. I know that Larson felt that he had strong reason to invalidate a single rotational base to explain all the atoms and that is why he decided to use the concept of two concentric orthogonal vibrations. How such a concentric pair could originate was not explained.

I am unaware if that supposition had any connection with the postulates or was merely *`gut-intuitive instinct'*.

This is a critical point for the overall rigour and concomitant validity of the Larsonian explanation of all atoms from hydrogen upwards, especially when presented to the scientific diaspora, all of whom are super-critical of a radical new theory, unless it is presented by one of their own gurus. (They scratch each others' backs.)

Hence my deductions immediately below:-

ALTERNATIVE DEDUCTIONS

Alternatively, we can see a more probable scenario.

Just as the original oscillations were brought about by a periodic reversal of direction, (for the photons), leaving two spatial dimensions in which to radiate uni-dimensionally, (linearly), consider that it is probable that some of these travelling photons may be subject to a reversal of direction in like manner to their own formation, and insodoing they each transform into a doubly-vibrating entity, which is still free to move outward in the S.S.E., but has only one spatial dimension available to do so.

Let us call it a *"Duplon or Biphoton"*.

WITHOUT ROTATIONS

If instead of considering all doubly-vibrating units, (duplons), as being rotated as described above, but that some of them are *`tracking'* the S.S.E. in like manner to the single units, (photons), then we would have a form of radiation, hitherto unidentified.

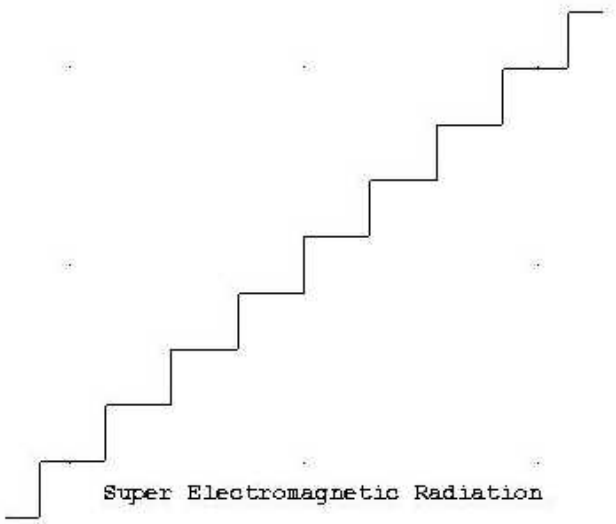
Let us call it a *"Super-Electromagnetic Wave"*.

Since it travels only in a single spatial dimension, (a linear path), then it would only be received by a receiver, that is directly in its path, hence such Super-Electromagnetic Wave radiation would be difficult to come across and recognise, since it would be an accidental encounter, until such time as a source can be identified.

However, it could be looked for and perhaps its eventual discovery could be a `*feather in the cap*' of RST.

$$x = \frac{1}{\sqrt{2}}[t + V(t)] \quad , \quad y = \frac{1}{\sqrt{2}}[t - V(t)]$$

Super Electromagnetic Wave



A crucial experiment is to find and identify it!!!!!!

WITH ROTATIONS

After hydrogen, the rotational base can be the doubly-vibrating entity, (duplon), that is rotated.

This doubly-vibrating unit, (duplon), is the very entity, that has previously been described by Larson as a two-photon unit. Needless to say that the first rotation applied to it is to counter the S.S.E. and the subsequent rotations are the contributions to gravity and its identity as a particular element. This may seem to some readers as `*nit-picking*', but it is really a clarification of the reality of the basis of RST and it overcomes the probability problem of two concentric photons. **Further it opens up a hitherto untrodden line of investigation. (See below)**

Perhaps we can acknowledge it to be the rotational base for the atoms in like manner to the basic rotational base for the subatoms. We can represent it with a double triplet:-

1-0-0
0-1-0

The probability of the existence of a double-vibrating entity is more feasible than two concentric vibrations, since it is easily deduced from the very postulates as was the original single vibration. The two vibrations are orthogonal (along the X axis and the Y axis), and their resultant is a single vibration along the line y = x. Then the rotations proceed as above to produce all the elements up to Larsonium, atomic number 117.

This new model also explains particles of matter, whose resultant spin is equivalent to an inward scalar motion in opposition to the S.S.E., and is a gyroscopic entity with concomitant mass.

SUMMARY OF THIS NEW ROTATIONAL BASE

Larson unjustifiably assumed, (independently from the postulates), that atoms after hydrogen are based on the rotation of a pair of concentric photons (oscillating space units), however there is a much more probable scenario revealing a much better candidate for rotation without deviating from the postulates and all their implications.

COMPARISON OF PHOTON WITH DUPLON

The photon, (while radiating in a plane as it is swept along with the S.S.E.), is subjected to an orthogonal vibration in exactly the same manner as the original space unit received its initial vibration. Thereby a doubly-vibrating unit, (biphoton or duplon), is formed, (the consequential counterpart to the photon), which can travel in the remaining spatial dimension, namely a linear path, participating in the S.S.E. as a mono-directional, seemingly-polarised, electromagnetic wave. **(Yet to be investigated/identified).**

Also it is a candidate for rotation as was the original photon, whereupon it can have the balance of the triplets of numbers, (not used by the photon for the subatoms and hydrogen), to specify the atoms, as we already know. The essential difference is that the biphoton traces a single and different space curve than that traced by the Larsonian photon pair would do as described above. The mathematics is certainly different, since the Larsonian pair of orthogonal vibrations is no longer pertaining.

Rather we have a single space unit doubly-vibrating and that means that the erstwhile pair of vibrations along the X and Y axes resp. now becomes a single vibration along the line y = x. This then is subject to the same spins about the X, Y and Z axes resp.. Also it does not matter if we make it Y, X and Z resp..

As a means to simplify an explanation of the physical universe, I would like to suggest an extended meaning to the concept *`Force'*. Heretofore, it applied solely to matter, but consider that there is a unique universal force, F_{Exp} that

1) can be applied both to matter in a special way and also
2) can be applied to non-matter, in particular, to photons & duplons.

Posit that this universal force is what drives the outward expansion of the universe, therefore accounting for the acceleration of distant galaxies towards very high speeds. Similarly it can be considered to be acting on all matter driving it away from all other matter, but this force is decidedly different to other forces in that it does not participate in the addition of local forces. This means that one cannot expect to resolve a triangle of forces as with regular forces.

Similarly, it *`drives'* the photons at a constant speed, but one cannot have addition of speeds/velocities.

e.g. When one turns on a light source while travelling.

Hence, when considering the doubly-rotating photon (duplon) this universal force is `*driving*' both of the orthogonal oscillations. It is the case for resolving only the direction of vectors but **NOT** the resolution of the magnitude of the two orthogonal velocities. So the oscillation along the X axis combines with the oscillation along the Y axis to produce an oscillation along the line y = x which is the equivalent of the oscillation-paths being rotated by ± ¼Π radians resp..

Similarly, the counterpart to this force, F_{Grav} is what drives the spin of the subatoms and atoms when they oppose F_{Exp}. It is this latter force, that can be attributed solely to the `*temporance*' of the gyroscopic behaviour of all matter, since in the absence of spin, there is no gravitational force.

(See later Newton's Equations (Non-linear motion) for full explanation of temporance, Page 24)

Also:-

1) Temporance, having the same dimensionality as time, enables our equations to put T in the numerator of some of the terms of our equations, without having the constant need for recourse to the cosmic sector, and

2) Temporance has offered RST the opportunity to fully investigate gyroscopic action and how it may enable us to predict much more about the elements and their interactions.

Whether this is a seminal idea is for the readers to assess.

We have Vibe3 = $[V(t), V(t), 0]^T$

So we have C.B.A.Vibe3 for the space curve

$$\mathbf{C.B.A} = \begin{bmatrix} \cos bt.\cos ct & \sin at.\sin bt.\cos ct - \cos at.\sin ct & \cos at.\sin bt.\cos ct + \sin at.\sin ct \\ \cos bt.\sin ct & \cos at.\cos ct + \sin at.\sin bt.\sin ct & \cos at.\sin bt.\sin ct - \sin at.\cos ct \\ -\sin bt & \sin at.\cos bt & \cos at.\cos bt \end{bmatrix}$$

$$\mathbf{C.B.A.Vibe3} = \mathbf{V}.\begin{bmatrix} -\cos at.\sin ct \\ +\sin at.\sin bt.\cos ct \\ +\cos bt.\cos ct \end{bmatrix}, \begin{bmatrix} \cos at.\cos ct \\ +\sin at.\sin bt.\sin ct \\ +\cos bt.\sin ct \end{bmatrix}, \begin{bmatrix} \sin at.\cos bt \\ -\sin bt \end{bmatrix}$$

$$= \left[\mathbf{V}_7, \mathbf{V}_8, \mathbf{V}_9\right]$$

---

3) THREE OSCILLATIONS

WITHOUT ROTATIONS

Now consider the doubly-oscillating entities, (duplons), while participating in the S.S.E., to have a reversal of direction, which immediately makes them triply-oscillating entities, (triplons), without any participation in the S.S.E. or gravity.

SPECULATIONS

Maybe they cannot exist individually due to their lack of participation in both the S.S.E. and gravity, so perhaps they combine with other entities upon their formation.

The existence of a triply-vibrating entity is easily deduced from the very postulates as were the original single vibration (photon) and the duplon. The three vibrations are orthogonal (along the X axis, Y axis and the Z axis), and their resultant is a single vibration rotated by ¼π radians above the line y = x.

Yet another crucial experiment for RST!!!!

WITH ROTATIONS

Now consider these triply-oscillating entities, (triplons), to be rotated in any, or all, three spatial dimensions, whereupon they gain mass due to the gyroscopic effect. They would also belong to a homologous series of entities in like manner to the atoms of the elements.

Let us call them *"super-elements"*. They are precluded from participating in the S.S.E. but, nevertheless, would be gravitating particles. Perhaps they can be found to conflict with some aspect(s) of the postulates and therefore are unstable. Alternatively, maybe we don't see obvious evidence of them because they have gravitated together in far-away places. Maybe they are part of the so-called *"dark matter"*.

Then rotations could proceed as with the regular subatoms and atoms to produce all the *`super-elements'* up to *`super-atomic number'* 117.

This new model, derived from the RST postulates, also explains particles of matter, whose resultant spin is equivalent to an inward scalar motion in opposition to the S.S.E., and is a gyroscopic entity with concomitant mass.

We have Vibe4 = $[V(t), V(t), V(t)]^T$

So we have C.B.A.Vibe4 for the space curve, that represents the *`super-elements'*.

C.B.A.Vibe4 =

$$\mathbf{V}.\begin{bmatrix} \cos at.\sin bt.\cos ct + \sin at.\sin ct & \cos at.\sin bt.\sin ct + \sin at.\sin bt.\sin ct & \cos at.\cos bt \\ -\cos at.\sin ct & +\cos at.\cos ct & +\sin at.\cos bt \\ +\sin at.\sin bt.\cos ct & -\sin at.\cos ct & -\sin bt \\ +\cos bt.\cos ct & +\cos bt.\sin ct & \end{bmatrix}$$

$$= \left[\mathbf{V}_{10}, \mathbf{V}_{11}, \mathbf{V}_{12}\right]$$

Perhaps they are massless particles, yet to be discovered and identified.

Perhaps these triplons are *`cousins'* of the neutrinos.

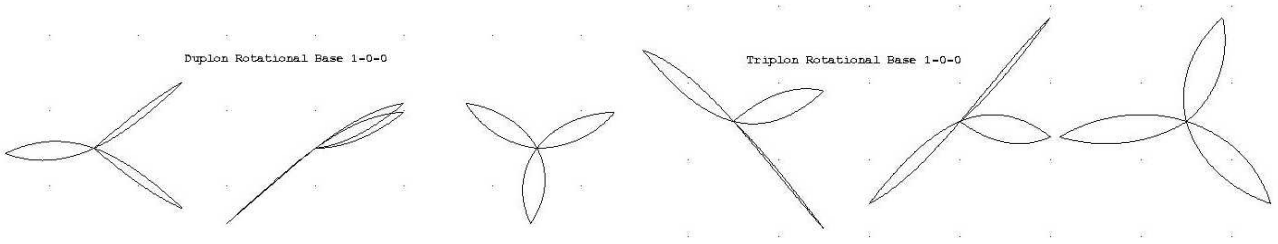
Perhaps they are a form of rotational base, that can be represented as a triple triplet:-

1-0-0
0-1-0

These, too, need to be discovered and identified.

Whether this is a critical idea is for the readers to assess.

Yet another crucial experiment for RST!!!!



Let the symbol << mean *"very much less than"*.

Let p << q << r

Let the probability of the occurrence of singly oscillating entities (photons, electromagnetic waves and subatoms) existing be 1/p.

Then the probability of doubly oscillating entities (duplons), atomic `*nuclei*' and atoms) existing is 1/q.

Then the probability of triply-oscillating entities, (triplons), existing is 1/r.

There is no evidence that q and r are infinite, therefore if it is a possibility, however small the probability, then these entities must be considered part of the physical universe, (mandatory), albeit as rare existents, and therefore **more predictions for RST!!!!**

The foregoing derivations utilise the same philosophy of Dewey Larson, as a result of which he made his predictions, the most notable being Pulsars and Quasars.

Whether this is a momentous idea is for the readers to assess.

I would appreciate any constructive criticisms.

POSTLUDE

These basic precursors to exotic particles, the duplon (or biphoton) and triplon (or triphoton) have been deduced from the postulates without any extra assumptions.

The biphoton is really no different in essence from a photon, since the two vibrations combine to result in a single vibration at 45 degrees to the two orthogonal vibrations. It only differs in its limited propagation, being in a straight line, comparable to any polarised radiation, if emitted continuously. This would depend on the particular generating source.

The triphoton, having utilised the three scalar dimensions for its oscillations, cannot participate in the S.S.E. as is. However it can be rotated to form a large variety of particles, which can gravitate. Then any such particle, whether existing in, generated in, or entering the local environment would not be noticed for its lack of participation in the S.S.E..

Nevertheless, if the ISUS-Discuss Group can agree with this derivation from the postulates re Duplons and Triplons, then perhaps some `*crucial experiments*' can be devised for their detection.

Perhaps such experiments have already been done and the results are available for re-interpretation.

I would imagine that the most likely source of these particles would be at the location of a galactic explosion when the thermal limit is approached and/or reached and/or exceeded.

The duplons would be beamed out like laser beams and their rotated forms could be the elements, that we know so well.

The triplons could not be radiated naturally, (by chance), but there is no reason that there could not be an astronomical event that could generate them and beam them out. If they were rotated to produce `*super-subatoms and super-atoms*', despite them being unable to participate in the S.S.E. in the normal way, they could be emitted from an explosion as missiles, but eventually they would be attracted to gravitating bodies.

Summarily, this represents a new concept within RST, that a particle can exist, that gravitates but does **NOT** participate in the S.S.E. **Perhaps it is mandatory that we include it within the RST paradigm.**

The reason for suggesting that we follow this path of deductions from the postulates is that in order to look for the difference between a massless particle and one with mass, one should expect the mass to be due to a gyroscopic effect, and currently, rotations are said to be present in some supposed massless particles as well as those with mass. Perhaps one could associate spin with gravitating particles only. Maybe legacy physics is wrong where it deems some particles to be massless.

The legacy version of spin is *"quantised intrinsic angular momentum"*, with the 1/2 spin odd and even multiples etc. to separate out the fermions and bosons.

BOSONS: They have a total spin angular momentum of $n\hbar$ where n is an integer and $\hbar$ is the Dirac constant

e.g. photon, phonon, alpha particle, meson, gluon, weakon

FERMIONS: Total spin angular momentum $(n+1/2)\hbar$ with n = 0,1,2 and where $\hbar$ is the Dirac constant.

e.g. Baryons and Leptons

Baryons: Neutron, Proton, Hyperon

Leptons: Electron, Negative Muon, Tau-minus particle and associated neutrinos

Dirac Constant $\hbar$ = Planck Constant $h/(2\pi)$

As opposed to legacy physics, our take on spin does not have to follow that tradition; RST subsumes continuous spin!.

CONJECTURE

Maybe we could investigate the various atoms and their respective spin-axes. Each spin triplet [a-b-c] has a resultant spin about some axis, which has an oblique inclination to the linear path of the outward expansion. Perhaps we could consider this geometry as a physical example of hindrance, (or facility), so that it may predict the possibility, (or impossibility), of some `*chemical*' reactions.

POETIC LICENTIOUSNESS-9

WITTY DITTY.....A FUN PUN ENDING LINES 4 & 1

With diligence and **NOUSE,**
You're as safe as a house,
If disciplined thought you abuse,
You tend to become **NO USE.**

SUBATOMIC PARTICLES AND ATOMS

1-0-(1)	Electron
1-0-0	Rotational base
1-0-1	Positron
1-1-(1)	Neutrino
1-1-0	Neutron
1-1-1	Unnamed particle

	Element	Atomic Number		Element	Atomic Number
2-1-(1)	Hydrogen	1	2-1-1	Lithium	3
2-1-0	Helium	2	2-1-2	Beryllium	4
2-2-0	Neon	10	2-1-3	Boron	5
3-2-0	Argon	18	2-1-4	Carbon	6
3-3-0	Krypton	36	2-2-(4)	Carbon	6
4-3-0	Xenon	54	2-2-(3)	Nitrogen	7
4-4-0	Radon	86	2-2-(2)	Oxygen	8
5-4-0	Unstable	118	2-2-(1)	Fluorine	9
2-2-1	Sodium	11			
2-2-2	Magnesium	12			
2-2-3	Aluminium	13			
2-2-4	Silicon	14			
3-2-(4)	Silicon	14			
3-2-(3)	Phosphorus	15			
3-2-(2)	Sulphur	16			
3-2-(1)	Chlorine	17			
3-2-1	Potassium	19	3-3-1	Rubidium	37
3-2-2	Calcium	20	3-3-2	Strontium	38
3-2-3	Scandium	21	3-3-3	Yttrium	39
3-2-4	Titanium	22	3-3-4	Zirconium	40
3-2-5	Vanadium	23	3-3-5	Niobium	41
3-2-6	Chromium	24	3-3-6	Molybdenum	42
3-2-7	Manganese	25	3-3-7	Technetium	43
3-2-8	Iron	26	3-3-8	Ruthenium	44
3-2-9	Cobalt	27	3-3-9	Rhodium	45
3-3-(9)	Cobalt	27	4-3-(9)	Rhodium	45
3-3-(8)	Nickel	28	4-3-(8)	Palladium	46
3-3-(7)	Copper	29	4-3-(7)	Silver	47
3-3-(6)	Zinc	30	4-3-(6)	Cadmium	48