The Synergetic Temperament System

The most fundamental ingredient of communication is the phenomenon of the common experience. It is the definition of this most basic experience that enables an idea, emotion or integrity to be transmitted from one to another. It is within this common experience through which expression and impression are realized. The definition of an experience necessitates first a common experience.

In language, the common experience is the alphabetical progression of sound. In art, it is the array of colour found on the artist's palette. In music, the common experience is the pitch/frequency modulation or progression of sound. It is called temperament, which is the system of adjustment of the intervals between the tones of an instrument of fixed intonation.

Individually, each component within these various common denominators is of very little meaning but combined, they synergetically form a medium through which the message is relayed. The message is the common experience and the common experience is defined by the medium.

Each and every medium is of unique expressive and impressive orientation thus confining the definition of an experience, idea or integrity within the parameters of its medium's structure. The expression and impression of an experience is of purely subjective matter with the definition of the experience being the object itself. The object of the experience is hence defined by the range and scope of the subjects' immediate and ultimate environments.

The purpose of this writing is to theoretically define a system of temperament or common experience in music in terms of the design and behavior of a 3-dimensional wave formation. It describes the tempering of sound in such a manner for sound is propagated through the environment in the manner of a pulsating sphere. It defines both the musical medium and message within the boundaries of a 3-dimensional structure.

The ideas and integrities within this essay have been realized through an intuitional reasoning with the aid of 3-dimensional models. The use of models in this manner have served to take the design of a sound wave formation off of a 2-dimensional surface and to give it 3-dimensional space.

It is through these models that this theory of system of temperament is developed. This conceptualization describes the phenomena of tempered sound in terms of geometric relationship rather than consonance and dissonance. It describes the relationship between the components within its structure as a whole system with an innermost (lowest) and outer-most (highest) frequency which together define the system's boundaries.

Conventional theories of temperament structure sound in terms of the octaval relationship. However, the system's conceptualization defines the equalization of temperament not through intervalic relationship but rather in terms of the rate of change of the motion and direction between the individual frequencies.

Finally and most fundamental to the theory of the system is the conceptualization of a state of least excitation of sound in which sound finds its energetic source. It is conceived that from within this state sound finds its source of propagation regardless of frequency, amplitude, duration and form. This state of least excitation is conceived to lie within the system' s structure at its innermost point and is the system' s common denominator from which the co-ordination or tempering of the sound within it is established.

There are areas in the complex phenomenon of the sounding of sound, which this writing does not address. The objective of this article is to describe to the reader in simple terms; a three-dimensional system of temperament design on the basis of the structure of a three-dimensional wave formation. Too many fields of discussion would only serve to confuse the issues at hand. For this reason they have been purposefully avoided.

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The Synergetic Temperament System is a mathematical co-ordination of sound. The co-ordination exists between; first, the frequencies within and without the system, second, the individual frequencies within the system itself and third, the whole system, its frequencies and a common nuclear source. The synergetic temperament system is a system of adjustment of the intervals between the tones of an instrument of fixed intonation.

The basic scientific principle on which the theory of the system is formulated, simply stated, is that sound is propagated through the environment in the manner of a pulsating sphere. The synergetic temperament system is conceived in terms of being a 3-dimensionally-integrated network of sound described by the formation of equidistantly spaced pulsating spheres lying one within and without another with a common nuclear core at its innermost point.

The synergetic temperament system is a coordination between the sound within and without the system. The sound without the system is that which is outside of the frequency range of the system. Tonal space defines the vast multitude of longitudinal vibrations, regardless of frequency, amplitude, duration and form. It encompasses sound, which is outside of human perception, normally limited to a frequency range between 16 cps to 10,000 cps.

The synergetic temperament system is a short section of the two million cycle-per-second-wide frequency spectrum of tonal space. It encloses and excloses a space within tonal space. It is a closed system. It is a tonal environment of unique quantitative and qualitative value determined by the frequencies within its structure and their inherent overtonal formation and interaction.

Tonal space can be conceived as being a space comprised of shells of pulsating spheres lying one within and without another with each shell being of specific frequency or pulsations per second. As sound is propagated through the environment in the manner of a pulsating sphere, then the space in which it finds its origins and completion must also conform to the design of this behavior.

Tonal space is a 3-dimensional bounded continuous expansion. It is bounded as it lies within the spaces of other frequency modulations but at the same tine it is a continuous expansion lying within the all-expanding phenomenon of universe. It is 3-dimensional for the events within it are of spherical structure.

A point is an abstraction that has no size, shape or extension. It can define the position of an event in space, which, in a 3-dimensional coordinate system, can be located through the description of three coordinates. A sphere, on the other hand, can geometrically represent the position, size or dimension of an event within a x,y,z coordination for it does not lack the intangible characteristics of an abstraction; it has size, shape and dimension.

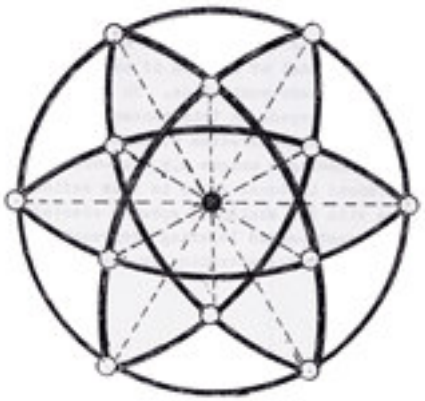
An event in space, whether sonic or otherwise, must be energetic. Without motion an event in space can not be defined. Energy is motion and the motion of energy through space always has direction. Vectors are symbols used to describe the motion and direction of energy. An energetic event has frequency or vibration. A vibration can be measured in terms of the field of its propagation, which through its very nature, takes up space, which in turn can be measured in terms of size, shape or dimension.

All energetic events, regardless of their manifestation, have one common property, which can be described in terms of excitation. Within the field of the vibration of an energetic event lie sub-fields of varying excitation. This excitation is progressive with the greatest excitation found in the outer-shell of the vibratory field and with the field of least excitation found within the event at its innermost point. All energetic events must be at one point of the same degree of excitation, zero excitation, for all energetic events have the common property of an energetic nuclear source which is of least excitation.

Tonal space can therefore be conceptualized in terms of being a collection or agglomeration of spheres (points) of uniform size lying in a closest-packed manner with each sphere being an idealized model of a field of energy at a level or quantum of last or zero excitation.

To further the conceptualization of tonal space in this manner, tonal space can be considered to be an agglomeration of closest-packed spheres which each sphere having a unique x,y,z coordination. The position of a sound in tonal space is thus defined by its nuclear sphere. The shells of spheres created through the procedure of closest-packed layering, progressively describes the space enclosed by the vibration or frequency of the sound.

Fig 1.



Tonal space enclosed by a first frequency-edged module sound where the black sphere defines the nuclear source of the sound and its location in space. White spheres define the frequency of the sound. All radii (broken lines) are of equal value and all spheres are of the same dimension. This diagram represents a first frequency-edge module sound as there is only one shell of layer of closest-packed spheres.

The coordination of sound within and without the synergetic temperament system is in terms of the realization of the 3-dimensional characteristic of tonal space and sound. Regardless of the position in tonal space, the configuration structured through the closest-packing of spheres around a central sphere of the same magnitude can be formed creating shells of spheres, lying equidistantly-spaced one within and without another, with each shell being of specific frequency or layer.

The synergetic temperament system is conceived as being a system of shells of varying progressive excitation with a state of least excitation found at its innermost core, and a state of greatest excitation found at the outer-most or highest frequency.

Sound is a longitudinal vibration which when stimulates the auditory nerves produces the sensation of hearing. Sound is propagated through the environment in the manner of a pulsating sphere. The integrity of a sphere is such that it divides space into the space outside the sphere, the sphere itself, and the space within the sphere. A sphere is a geometric figure in which all radii are of equal value, thereby causing it to be dynamically in a state of equilibrium.

The movement or vibration of a pulsating sphere is through an alternating series of expansions and contractions. The expansive force within a pulsating sphere radiates from a source found at the sphere's nuclear point. This force is dynamically opposed by a compressive force found outside the sphere, which gravitates towards the sphere's nuclear core.

The omni-directional expansion of a pulsating sphere is caused by the radiational force within it. The sphere will continue to expand until the gravitational force outside of it becomes too great for its radiation. At this point, the sphere will progressively contract towards its innermost or nuclear core until the radiational force within the sphere becomes too great for its gravitation, thus causing the sphere to expand once again.

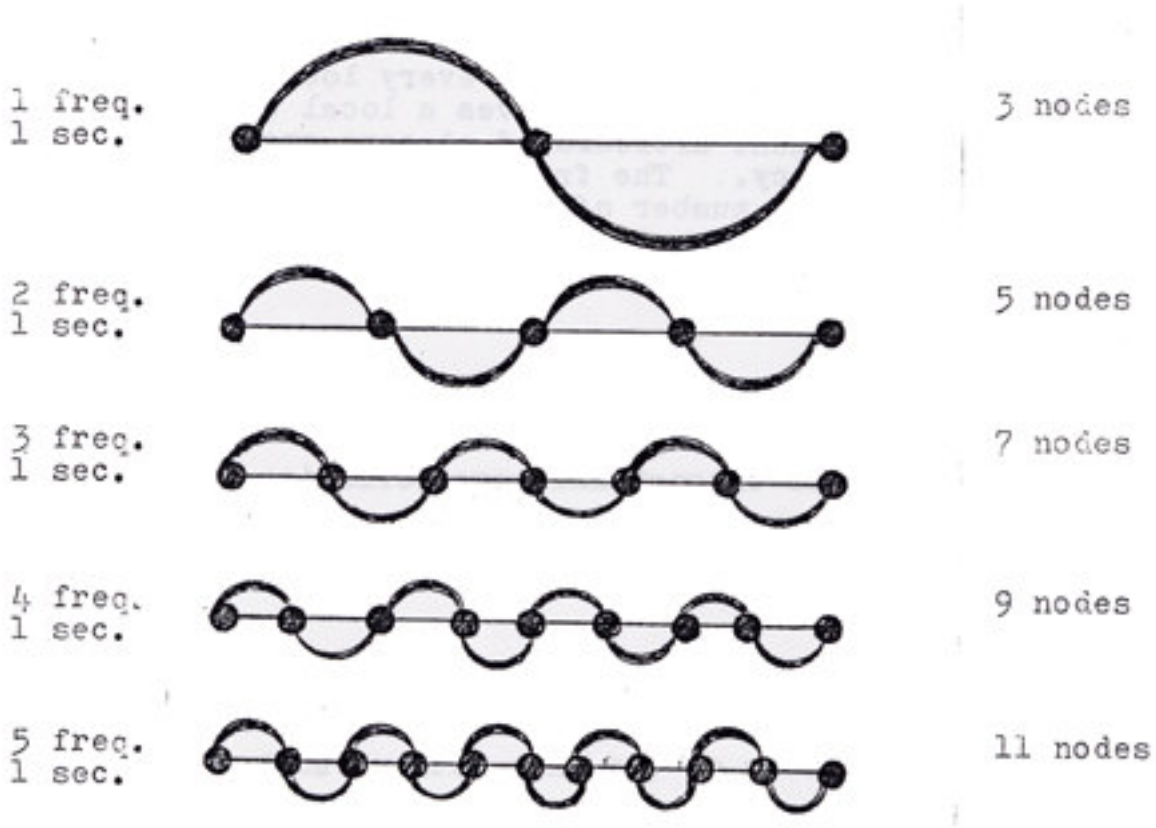
The quantity of energy found within this pulsation gives sound its amplitude, but the repetitive fluctuation of the forces within this pulsation gives sound its frequency or pitch. Frequency is the number of complete cycles of expansions and contractions in unit time of a pulsating system or event.

> Frequency, in short, is the measure of extreme modular subdivision development of a finite system. When the term “frequency” is used in physics, its meaning is taken in just such a sense. Since energy can be neither created nor destroyed, every local event in the universe involves a local energy investment articulated at some specific frequency. The frequency number is the relative number of repeat oscillations, which occur until the unit energy, assigned to that patterning is exhausted.[i]

Frequency is equal to the number of vibrations per second. In terms of a 2-dimensional wave formation, one second is equal to a minimum of three nodes where the number of nodes within a frequency is equal to the frequency times two plus one.

Nodal points are regions in an interference pattern at which some characteristic of the wave motion, such as particle displacement, particle velocity or pressure amplitude has a minimum of zero value or zero excitation.

Fig 2.



In a 2-dimensional wave formation, frequency is equal to the number of nodes in its structure minus one, divided by two.

A 2-dimensional wave formation is a description of a finite system or sounding event where there exists the possibility of two directions in which the energy can travel regardless of the frequency of the wave formation. The number of the frequency of a 2-dimensional wave formation is always equal to the number of directions in which the energy can flow, multiplied by the frequency's edged-modulation plus one.

The total number of nodal points in a 2-dimensional ware formation, minus one, divided by the number of directions in which the energy can travel gives the frequency number or relative number of repeat oscillations which occur until the energy assigned to that energy patterning is exhausted.

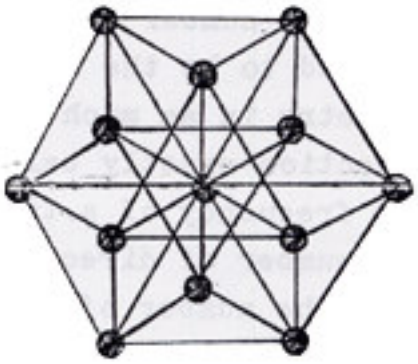
In whole number frequencies, the innermost node can be considered the node that gives the wave formation dynamic symmetry in as much as the behavior of the wave in a positive direction exactly balances that which is in a negative direction. The frequency of a 2-dimensional wave formation is equal to the

number of directions in which the energy can flow, divided into the number of nodal points found outside of the innermost node.

Frequency-edged modulation of one second in a 2-dimensional wave formation is at least a minimum of three nodes. If the propagation of sound is described in a 3-dimensional manner in terms of wade formation, as to take into account the whole phenomenon of sound's omni-directional propagation, a minimum of 13 closest-packed nodal points are needed to describe frequency-edged modulation of one second.

Fig 3.

2-dimensional wave formation
of nodal points equaling one second.



3-dimensional wave formation
of nodal points equaling one second.

Fig 4.

A	B	C	D	E
1 frequency	2	12	3	13
2 frequency	4	42	5	55
3 frequency	6	92	7	147
4 frequency	8	162	9	309
5 frequency	10	252	11	5611
6 frequency	12	362	13	923
7 frequency	14	492	15	1415
8 frequency	16	642	17	2057
9 frequency	18	812	19	2869
10 frequency	20	1002	21	3871
11 frequency	22	1212	23	5083
12 frequency	24	1442	25	6525

A – The number of frequency-edged modulations.

B – The number of nodal points in a 2-d wave formation minus the innermost node.

C – The number of nodal points found in the outer-shell of a 3-d wave formation.

D – Total number of nodal points found in a 2-d wave formation.

E – Total number of nodal points found in a 3-d wave formation.

In a 2-dimensional wave formation, nodal points are packed extending in two directions - one positive, the other negative. In a 3-dimensional wave formation, nodal points are closest-packed, extending in 12 directions. In a 2-dimensional wave formation, the number of nodal points outside the innermost node defines the frequency of the wave. In a 3-dimensional wave formation, the number of points found in the outer-shell defines the frequency.

The geometric configuration formed by the closest-packed layering of spheres around a central sphere of the same magnitude is called the *vector equilibrium* or *cubo-octahedron*. The vector equilibrium is a polyhedron bounded by eight triangular faces and six quadrangular faces.

> The name (vector equilibrium) is derived from the fact that the radial vectors of this figure have the same value as the circumferential vectors. In terms of dynamics, the outward thrust is exactly balanced by the restraining chordal force; thus the figure is an equilibrium of vectors.[ii]

The number of spheres needed to enclose a central sphere of the same size is 12. If the same omni-directional closest-packed layering in continued, 42 spheres will enclose the 12, 92 will layer the 42, 162 will layer the 92 and so forth. The formula used to describe this behavior is found in the *Energetic Synergetic Geometry* of R. Buckminster Fuller. It reads as follows:

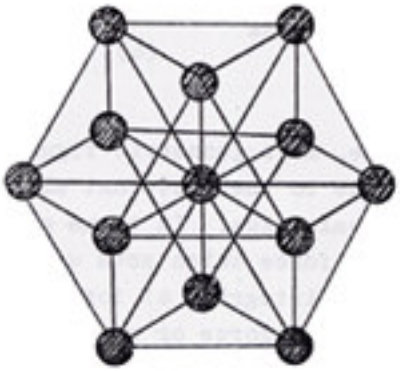
$$P = 2 + (2*5) * (F)^2$$ [iii]

> The number of points in the outer layer (shell) of any symmetrical system (vector equilibrium), is 2 plus 2 times 5, multiplied by the system's edge frequency to the second power.[iv]

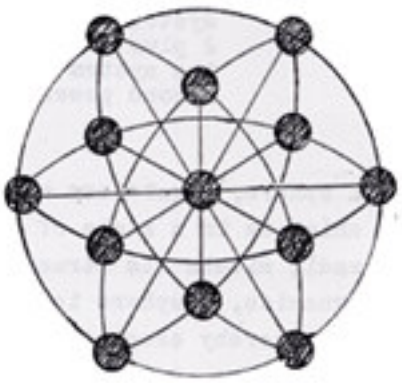
A sphere, regardless of its magnitude, is a geometric figure, which is in a state of equilibrium due to the fact that all radii within its structure are of equal value. In terms of dynamics, a sphere is balanced by the force that acts upon it, thereby causing it to maintain its integrity of form. In a sense, a sphere is an equilibrium of force or an equilibrium of vectors.

A straight-lined vector may exist in the abstract but in a practical framework this does not hold ground. The motion of energy through space is always geodesically inclined due to the pull of the most fundamental force of gravity. Therefore, the vector equilibrium can be considered to be of spherical representation in terms of being a configuration created through the intersection of four great circles in which their intersection produces the twelve major vertices of the vector equilibrium.

Fig. 5



One frequency vector equilibrium



One frequency vector equilibrium in spherical representation

The closest-packing of spheres around a central sphere does not produce the supra-structure of a sphere, but that of a vector equilibrium. Regardless of the frequency-edged modulation of the vector equilibrium its structural design of 14 faces and 12 major vertices remains constant.

The greatest level of excitation of an energy system is found in its outer-shell. Energy systems are contained explosions and implosions. In terms of dynamics, energy systems are in a state of equilibrium of these two forces.

The number of points found in the outer-most shell of the various frequency-edged modulations of the vector equilibrium is representative of the level of excitation found within its structure. In a one frequency-edged modulation, the excitation level is at a value of 12. In a two frequency-edged module, the level of excitation is at 42 and so forth. The only factors that remain common in all frequency-edged modulations are first, the structural design and second, the number of directions through which the configuration is formulated.

The vector equilibrium is a coordinate system in the sense that the various sequential frequency-edged modules lie equidistantly spaced one within and without another with a common nuclear core found at its innermost point.

The 2-dimensional wave formation is also a coordinate system of equidistantly extended nodal points with an innermost node. As sound is propagated through the environment in the manner of a pulsating sphere, it seems logical to assume that the 2-dimensional wave formation is not adequate to describe it as a 3-dimensional event.

The synergetic temperament system is a coordination between the frequencies within its structure. This coordination finds its basis in the design of a 3-dimensional wave formation, which conforms to sound's omni-directional design and behavior. The vector equilibrium can be used to describe such a design and behavior.

Fig 6.

One frequency
2-d wave formation

One frequency
3-d wave formation

Four intersecting hexagons equal one vector equilibrium.

Combined these four hexagons are representative of the omni-directional propagation of sound.

There exist 12 essential waves per wave formation (three waves per hexagon), as there are 12 directions in which the energy will travel to and from the wave's nuclear source.

Fig 7.

2-d wave formation of
two frequency per second.

3-d wave formation of two frequency
per second.
Note: This is a partial illustration only.
Four intersecting hexagons equal one
vector equilibrium or one 3-d wave formation.

The synergetic temperament system is a system of adjustment of the intervals between the tones of an instrument of fixed intonation where each tone is of a specific frequency in cycles per second. It is a system comprised of equidistantly spaced spherical shells or vector equilibriums of various sequential frequencies lying one within and without another with a common nuclear core or source.

In a 2-dimensional wave formation, the frequency-edged modulations is equal to the number of directions in which the energy will travel divided into the number of nodal points found outside of the innermost nodal point.

The nodal points found outside of the innermost node determines the level of excitation or field of propagation per second within its structure. In a 2-dimensional wave formation, frequency number is always equal to the same value in cycles per second.

In a 3-dimensional wave formation however, there are 12 directions in which the energy will flow to and from the innermost nodal point. If this number of directions is divided into the number of nodal points found in the outer-shells of the various frequency-edged modulations, which defines the field of propagation or level of excitation of the wave, a series of values are created, which when assigned to the wave formations are considered to be frequency values in cycles per second.

The formula used to describe such a procedure is:

$$T = \frac{2 + (10) * F^2}{12}$$

Simply stated, the frequency value of a 3-dimensional wave formation, in the structure of the vector equilibrium, in cycles per second, is equal to the number of nodal points found in the outer-shells of the configuration divided by 12.

The coordination of the equidistantly-spaced frequencies within the synergetic system can be mathematically determined through the progressive sequence of their second order differences which yield a value of 1.666… cycles per second per second. This value is the system's acceleration rate, which describes the frequencies within the system. This value describes the whole system's movement and direction in terms of velocity through tonal space.

The following figure lists first in column (A), the frequency-edged modulation of the wave formations, second, in column (B), the number of nodal points found in the outer-shells of the wave formations, third in column (C), the frequency values of the synergetic temperament system in cycles per second, fourth, in column (D), their first order differences and fifth, in column (E), their second order differences.

Fig 8.

A	B	C	D	E
1	12	1		
2	42	3.5	2.5	
3	92	7.666…	4.1666…	1.666…
4	162	13.5	5.8333…	1.666…
5	252	21	7.5	1.666…
6	362	30.1666…	9.1666…	1.666…
7	492	41	10.8333…	1.666…
8	642	5305	12.5	1.666…
9	812	67.666…	14.1666…	1.666…
10	1002	83.5	15.8333	1.666…
11	1212	101	17.5	1.666…
12	1442	120.1666…	19.1666…	1.666…
13	1692	141	20.8333…	1.666…
14	1962	163.5	22.5	1.666…
15	2252	187.666…	24.1666…	1.666…
15	2562	213.5	25.8333…	1.666…
17	2892	241	27.5	1.666…
18	3242	270.1666…	29.1666…	1.666…
19	3612	301	30.8333…	1.666…
20	4002	333.5	32.5	1.666…
21	4412	367.666…	34.1666…	1.666…
22	4842	4.3.5	35.8333…	1.666…
23	5292	441	37.5	1.666…
24	5762	480.1666	39.1666…	1.666…
25	6252	521	40.8333…	1.666…
26	6762	563.5	42.5	1.666…
27	7292	607.666…	44.1666…	1.666…
28	7842	653.5	45.8333…	1.666…
29	8412	701	47.5	1.666…
30	9002	750.1666…	49.1666…	1.666…
31	9612	801	50.8333…	1.666…
32	10242	853.5	52.5	1.666…
33	10892	907.666…	54.1666…	1.666…
34	11562	963.5	55.8333…	1.666…
35	12252	1021	57.5	1.666…
36	12962	1080.1666…	59.1666…	1.666…
37	13692	1141	60.8333…	1.666…
38	14442	1203.5	62.5	1.666…
39	15212	1267.666…	64.1666…	1.666…
40	16002	1333.5	65.8333…	1.666…

Fig 8 con't.

41	16812	1401	67.5	1.666…
42	17642	1470.1666…	69.1666…	1.666…
43	18492	1541	70.8333…	1.666…
44	19362	1613.5	72.5	1.666…
45	20252	1687.666…	74.1666…	1.666…
46	21162	1763.5	75.8333…	1.666…
47	22092	1841	77.5	1.666…
48	23042	1920.1666…	79.1666…	1.666…
49	24012	2001	80.8333…	1.666…
50	25002	2083.5	82.5	1.666…
51	26012	2167.666…	84.1666…	1.666…
52	27042	2253.5	85.8333…	1.666…
53	28092	2341	87.5	1.666…
54	29162	2430.1666…	89.1666…	1.666…
55	30252	2521	90.8333…	1.666…
56	31362	263.5	92.5	1.666…
57	32492	2707.666…	94.1666…	1.666…
58	33642	2803.5	95.8333…	1.666…
59	34812	2901	97.5	1.666…
60	36002	3000.1666…	99.1666…	1.666…
61	37212	3101	100.8333…	1.666…
62	38442	3203.5	102.5	1.666…
63	39642	3307.666…	104.1666…	1.666…
64	40962	3413.5	105.8333…	1.666…
65	42252	3521	107.5	1.666…
66	43562	3630.1666…	109.1666…	1.666…
67	44892	3741	110.8333…	1.666…
68	46242	3853.5	112.5	1.666…
69	47112	3967.666…	114.1666…	1.666…
70	49002	4083.5	115.8333…	1.666…

The coordination between the whole system, its parts or frequencies, and a common nuclear core or source is through the procedure of division of 12 into the number of nodal points found in the outer-shells of the various frequency-edged modulations of the vector equilibrium. In other words, all cycles per second values, when multiplied by 12, (the number of directions through which sound or energy is propagated), are equal to the number of nodes found in the outer-shells of the various frequency-edged modulation of the vector equilibrium, or of a sphere created through the interaction of four great circles.

Physically speaking, it is a coordination between equidistantly spaced pulsating spheres in their state of greatest compression and greatest tension. Irrespective of the frequency-edged modulations, all totally compressed spheres have the same value of force located or centralized in the region of their innermost core, while at the same time, individually, each is of unique nodal value or force when in its state of greatest expansion or tension.

The coordination between the system, its parts, and a common nuclear core is established through the mathematical procedure of division of an energy system's or sound's potential nuclear energy and direction, found in its outer-shell. Three-dimensionally, nuclear potential energy is of zero excitation or zero speed but it has a factor or 12 potential directions for propagation illustrated through the closest-packing of spheres as described above.

Energy systems are of varying energy and direction but they have the same velocity value at the level of their innermost nuclear core. All energy systems have a field of possibilities or a propagative field or a vibratory field or a space which can be described by the number of nodal points found in their respective outer-shells.

Thus, the coordination of the frequencies and a common nuclear source within the synergetic temperament system is through the division of the nuclear potential energy, its motion and direction, which is common to all frequencies, into the space of field of propagation of the various frequencies which is defined by the number of points found in their outer-shells.

Proof of this coordination between the frequencies themselves and between the frequencies and a common nuclear source, in terms of the change of motion and direction between the adjacent shells of frequencies and the first frequency and adjacent shells of frequencies and the first frequency and the common nuclear core, can be mathematically established through determination of an acceleration rate. In other words, the shells of the adjacent frequencies progressively increase in excitation, frequency, direction and space at a rate of 1.666... cycles per second per second or at a ratio of 3:5.

While the acceleration rate, in measurement of the rate of change in motion and direction between the adjacent shells within the system, remains constant, the intervalic ratios between the adjacent frequencies do not adhere to the same behavior. The intervalic ratio relationships between the frequencies within the system progressively diminish in size. For example, where the intervalic ratio between the first and second tones of the system, respectively 21 cps and 30.1666 cps, is of a value of 1.4365079, the intervalic ratio between the last two tones, 3967.66 cps and 4083.5 cps is of a value of 1.0291943.

This phenomenon seems to conform to the same behavior found in the intervalic ratios found between adjacent whole numbers. For example, the intervalic ratio between 1 and 2 is 2, but the intervalic ratios between the higher adjacent whole numbers progressively diminish toward 1 but never obtains unity. In the synergetic temperament system, the energetic behavior between adjacent frequencies remains constant while at the same time; the frequencies progressively increase in value thus diminishing their sequentially adjacent intervalic ratios.

Fig. 9

A	**B**
1:2	2
2:3	1.5
3:4	1.333…
4:5	1.25
5:6	1.2
6:7	1.1666…
7:8	1.1428571
8:9	1.125
9:10	1.111…
98:99	1.01204
998:999	1.001002
9,998:9,999	1.0001
99,998:99,999	1.00001
999,998:999,999	1.000001
999,999,999,998:999,999,999,999	1.000000000001

A – Ratio
B – Ratio Value

In the same manner that the intervalic ratios
between whole numbers progressively diminish,
so do the intervalic ratios of the frequencies
in the synergetic temperament system progressively
decrease in size but never obtains the value of unity.

The synergetic temperament system differs in conceptualization from other systems of temperament. First, it uses a 3-dimensional wave formation to describe the design and behavior of the propagation of sound. Second, it does not use the octaval relationship as the fundamental interval for the structuring of frequencies.

Any sub-division of the octave necessitates a root derivative of 2 which, in every case, is always an irrational number. Due to this mathematical phenomenon, the intervalic relationships structured in context of the octave are also irrational. For example if a tone is desired seven octaves above a given tone, the given tone's frequency is increased by a factor of 1:2 to the seventh power or $(2)^7$. When the same procedure is followed, except that the interval of a fifth is substituted in order to obtain the same seventh octave tone, the frequency of the former seventh octave tone is overstepped by a small margin. $(2:3)^{12}$ or $(1.5)^{12}$ or 129.74663 which is greater than $(2)^7$ or 128 by a factor of the difference of the two intervals. This phenomenon occurs with all intervalic sequential ordering. For an illustration of this behavior see Fig. 11. In this chart, all intervalic sequential ordering should reach an octaval relationship.

Fig. 11

Interval Name	Frequency Ratio	Ratio in decimal form	Closest # of intervals to reach octave	Intervalic factorial value	True octaval factorial
Unison	1:1	1			
Minor Second	15:16	1.0666…	12	2.1694	2
Major Second	8:9	1.125	6	2.0272	2
Minor Third	5:6	1.2	4	2.0736	2
Major Third	4:5	1.25	3	1.9531	2
Diminished Fourth	25.32	1.28	3	2.097	2
Perfect Fourth	3:4	1.333…	12	31.5693	32
Augmented Fourth	32:45	1.40625	2	1.97753	2
Diminished Fifth	45:64	1.4222…	2	2.0227	2
Perfect Fifth	2:3	1.5	12	129.74663	128
Augmented Fifth	16:25	1.5625	3	3.81496	4
Minor Sixth	5:8	1.6	3	3.81496	4
Major Sixth	3:5	1.666…	4	7.7160	8
Minor Seventh	9:16	1.777…	6	31.56932	32
Major Seventh	8:15	1.875	12	1888.066	2048
Octave	1:2	2	1	2	2

The octave is the most perfect consonance,
so perfect that it gives the impression of duplicating
the original tone, a phenomenon for which no
convincing explanation has ever been found, Its singularity
becomes apparent if the acoustical frequencies are
compared with the series of color frequencies (spectrum),
which does not show any duplication. The fundamental
importance appears also from the fact that it is the only
interval common to practically all scales ever evolved,
regardless of the number of pitch of the intermediate steps.[v]

Within the structure of a 2-dimensional wave formation it is possible to have the interval of the octave as the number of nodes outside of the innermost node are always of even value. However, in the structure of a 3-dimensional wave formation, while frequency-edged modulation can be doubled, the number of nodes found in the outer-shells do not correspond to this form of behavior. One explanation for this phenomenon can be expressed in terms of *synergy*, which is the behavior of a whole system, which is unpredicted by the sum of its parts.

A	B	C	D	E
1	12	2	42	30
2	42	4	162	120
3	92	6	362	270
4	162	8	642	480
5	252	10	1002	750
6	362	12	1442	1080
7	492	14	1962	1470
8	642	16	2562	1920
9	812	18	3242	2430
10	1002	20	4002	3000
11	1212	22	4842	3630
12	1442	24	5762	4320

A – Number of frequency-edged modulation of a 3-d wave formation

B – Number of points found in the outer-shell of (A)

C – Frequency—edged modulation which is twice (A)

D – Number of points found in the outer-shells of (C)

E – Difference in the number of nodes found between (A) and (C)

101.01 Synergy means behavior of whole systems unpredicted by the behavior of their parts taken separately

102.00 Synergy means behavior of integral, aggregate, whole systems unpredicted by behaviors of any of their components or assemblies of their component taken separately from the whole

> 103.00 A stone by iself does not predict its mass attraction for and by another stone. There is nothing in the separate behavior or in the dimension or chemical characteristics of any one single metallic or non-metallic massive entity which by itself suggests that it will not only attract but also be attracted by another neighboring massive entity. The behavior of these two together is unpredicted by either one by itself. There is nothing that a single massive sphere will can or ever do by itself that says it will both exert and yield attractively with a neighbouring sphere and that it yields progressively: every time the distance between the two is halved, the attraction wll be fourfolded. This unpredicted, only mutual behavior is synergy. Synergy is the only word in any language having this meaning.[vi]

This unique behavior of synergy, in analysis of a 3-dimensional wave formation, becomes exceedingly obvious in realization that the number of nodal points found in the outer-shell, which defines the boundaries of the wave, is unpredicted by the sum of its parts; its inner nodes. Where one frequency-edged modulation has a value if 12 modal points, it is assumed that the second frequency-edged modulation would have a value of 24 nodal points in its outer-shell but this is not the case, it has 42 nodal points in its outer-shell, defining its boundaries.

Fig. 13

A	B	C	D	E	F
1	12	2	24	42	18
2	42	4	84	162	78
3	92	6	184	362	178
4	162	8	324	642	318
5	252	10	504	1002	498
6	362	12	724	1442	718
7	492	14	984	1962	978
8	642	16	1284	2562	1278
9	812	18	1624	3242	1618
10	1002	20	2004	4002	1998
11	1212	22	2424	4842	2418
12	1442	24	2884	5762	2878

A- Number of frequency-edged modulation of a 3-d wave formation

B- Number of points in outer-shell of (A)

C- Number of frequency-edged modulation which is twice (A)

D- Number of points that should be in outer-shell of (C), i.e.: twice the value of (A)

E- Number of points found in the outer-shell of (C)

F- Synergetic difference between (D) and (E)

Thus, the octaval relationship is not present within the structure of the synergetic temperament system as the behavior of the nodes in the outer-shells of its various frequency-edged modulations progress synergetically thereby contradicting conventionally assumed values determined through the observation of a 2-dimensional wave formation. The whole system is unpredicted by the sum of its parts.

The synergetic temperament system is conceived in terms of being an integrated network of sound without the fundamental interval of the octave. While in general, most systems of temperament have used this interval as the basis of their structure, the synergetic temperament system finds the synergetic progression of equidistantly spaced pulsating spheres, lying within and without another with a common nuclear core at its innermost point, to be fundamentally void of this relationship.

200.1 Synergetics promulgates a system of mensuration employing 60-degree vectorial coordination comprehensive to both arithmetic and geometry, in rational whole numbers.

200.02 Synergetics originates in the assumption that dimension must be physical; that conceptuality is metaphysical and independent of size; and that a triangle is a triangle independent of size.

200.03 Since physical Universe is entirely energetic, all dimension must be energetic. Synergetics is energetic geometry since it identifies energy with number. Energetic geometry employs 60-degree coordination because that is nature's was to closest-pack spheres.

200.04 Synergetics provides geometrical conceptuality in respect to energy quanta. In synergetics, the energy as mass is constant, and nonlimit frequency is variable.

200.05 Vectors and tensors constitute all elementary definitions.[vii]

The synergetic temperament system employs a system of measurement of the pulsating spheres within its structure through the use of a 60-degree vectorial coordination in whole rational numbers. It identifies the individual shells of spheres in terms of an energetic number; the number if nodal points in outer-shells. The closest-packing of spheres produces shells of spheres lying, equidistantly spaced, one within and without another, with a common nuclear core found at the system's innermost point. The synergetic temperament system employs 60-degree vectorial coordination because that is nature's way to closest-pack spheres.

It is possible that the series of colour frequencies does not show any duplication because it uses the 60-degree vectorial coordination as describes in the Energetic Synergetic geometry of R, Buckminster Fuller. Fuller describes this geometry in terms of being 'The Coordinate System of Nature.' It is possible, that in using this coordinate system in music through the medium of temperament, the synergetic temperament system defines a holistic progression of frequency-determined sound in terms of Nature's design and behavior.

At the present moment, the effect of such a progression of sound in terms of human physiology and psychology is not known. In the past, music theorists have not dealt with the problems of temperament from outside of the constraints of the octave. Therefore, the possibilities of such a manifestation is also not known.

The question of whether or not the synergetic temperament system is a valid medium of expression will only be determined in terms of the impression it creates. Time and extensive experimentation will be the judge. However, it is of the author's intuitive belief that the synergetic temperament system, in employing a 3-dimensional wave formation to describe the spherical propagation of sound, in the design of the vector equilibrium, as the basis of its structure, follows the laws of nature as predicted by nature, not by man. If this is true, then the expression and impression of an idea, emotion or integrity transmitted within this medium will be of great potential

[i] Fuller, Buckminster and Marks, Robert, “The Dymaxion World of Buckminster Fuller” Doubleday Anchor, AO-35, page 46.
[ii] Meller James, Buckminster Fuller Reader, The, Pelican Book, 1973, Pg. 385
[iii] Fuller, Buckminster, and Marks, Robert, “The Dymaxion World of Buckminster Fuller, Doubleday Anchor AO-35, pgs 46-47.
[iv] Ibid. page 47.
[v] Apel Willi, Harvard Dictionary of Music, Second Edition, Revised and Enlarged, Belknap, Harvard, pg. 589.
[vi] Fuller, R. Buckminster, Synergetics: Explorations in the Geometry of thinking, Macmillan Publishing, 1978 pg.3.
[vii] Ibid. pg. 22.