

EYES + EARS = IDEAS By: Barbara Hero

"Fact or Fancy? Probable or Improbable? Possible or Impossible? This entertaining, potential look at the forces of the universe, their relationship to each other and mankind is required reading/viewing for all thinking beings. Applying the "What if..." test of development the author has provided an artistic rendering of mathematical relationships between form and substance, sound and light as only an artist/musician turned mathematician can explore and explain it." (Editor)

THIS BOOK IS DEDICATED:

To all those souls who are searching for truths off the beaten paths.

ALSO BY BARBARA HERO

"Lambdoma Unveiled (*The Theory of Relationships*)" "The Glass Bead and Knot Theory of Relationships" "Lambdoma Harmonic Intervals"

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To Barbara, in recognition of your work. F. Wayne Grimm (Pakenham, Ontario, Canada)

Renewing Ancient Ways By F. W Grimm - 1993

You penetrate the rules of sound to give the pause of silence; a measure of singing worlds;

Wise pearls for beads of truth a single thread from quark to grand galactic wheels and far beyond matter's final gates-

Endless wild wonder, Worlds upon worlds within worlds.

You bend to the needs of broken lives To bring this tread for their mending. erund di Bredspus unig e undemanding 2012 i jarendatariegi la indiviarity end their quality al its

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ABOUT THE AUTHOR

Barbara Hero author of "Lambdoma Unveiled (*The Theory of Relationships*)," and "Glass Bead and Knot Theory of Relationships" is a creative musician, mathematician and artist. She possesses the unique ability to unify these three disciplines into an interrelated functional theory of existence, known as the Lambdoma. She has written and lectured extensively on the wisdom encoded within this ancient matrix of whole number ratio's attributed to Pythagoras.

Born in Washington D. C, daughter of the late artist, Lucile Evans Ferrell, Barbara's life's works in music lead her to focus on the relationship of mankind to the universe and the development of methods to assist individuals in attuning to their own fundamental vibrations. Exploring the intricacies of architecture and its relationship to sound she found interesting relationships between the spaces we live in, the sounds we encounter and the lives that we lead.

Further research led Barbara to the works of Pythagoras, which included a diagram outlining the mathematics of harmony. Acquiring a degree in mathematics she confirmed that there was a relationship between color and music (sight and sound). Researching mathematical frequencies of light and sound, she developed a unique understanding of their interrelationship to individuals and their quality of life.

While working with Boston Massachusetts drug rehabilitation programs she had the opportunity to put her accumulated knowledge to use. She taught addicts to draw what they were feeling. Her investigation of the healing properties of Lambdoma sound inspired her to introduce this music to the art-therapy classes. She noted that her students responded remarkably. Many, inspired by the music, produced symbolic abstract drawings.

Working with her "Creative Application Engineer," Robert M. Foulkrod, she has developed unrivaled methods, using computer processing and laser projection, to document and present musical frequencies.

Computer-generated tones, based on the ancient diagram, have produce unequaled mathematically perfect meditation tapes. The logical "right brain" becomes entranced with the perfect sound intervals. The creative "left brain," now free from interference, produces an unrestricted flow of stimulation leading to the potential production of art, poetry, music and feelings. Many different doorways to ourselves unlock and open wide. Her methods enable individuals to find their own personal "Key Note" or "Resonant Frequency," to recognize their various "Chakras." Personal voice patterns in the form of "Keynotes" combined with the Lambdoma musical scale enable participants to observe indications of balances or imbalances.

"An emotional healing on an emotional and spiritual level," is her description of the combined experience of the individual.

She has processed much of this knowledge into music, books and produced a series of audio cassettes directed toward bringing the individual into harmony with the universal energies.

ABOUT THIS BOOK.

This book was conceived in the early nineteen seventies, after a decade of trying to find a link between visual art and music. The connection was finally found by joining color to the musical notes attributed to Pythagoras, and by using an ancient description of mathematical ratios in a twodimensional matrix (known as "the Lambdoma") which unites the harmonics of musical intervals.

An artist is free to step over boundaries in ways that mathematicians, scientists or other disciplinarians cannot. Viewing from the outside provides an entirely different perspective often revealing overlooked or unexplored avenues.

This work thus became a foundation upon which to construct visual representations of relationships. In turn this leads to other areas to potentially explore possibility and probability. Much ended in fantasy, much in fact.

To separate the two is not the purpose of this work. To open the doors of the mind to imagination and exploration is a greater challenge. After all much of what we take for granted today was revolutionary or heretical thought at one time. {i.e. Jules Verne's "Vingt Mille Lieues sous les mers" (1870: Twenty Thousand Leagues Under the Sea) and "De la Terre a la Lune" (1865: From the Earth to the Moon) foretold of the submarine and man on the moon}.

One reviewer of this book commented:

"These are the illustrations for a new text in physics which has not yet been written".

After the drawings had been completed, narrative was prepared in an attempt to describe the imaginative thought processes of the artist while drawing. They read somewhat like a stream of consciousness, sometimes unearthly, dream like, a translation from sound to sight by way of a sort of metaphysical

mathematics.

Of the four sections in this book the drawings from "Start, Stop, and Think" were displayed in a solo art exhibition at Max Protetch's Gallery in Washington, D.C. At that exhibition <u>a flutist played</u> the drawings, translating sight to sound.

Consequently scores were subsequently written for "Start, Stop, and Think" and "The Other Side of Art". These scores were recoded on a moog and minimoog at Robert Ceely's "BEEP Studio", in the Boston, Massachusetts area. Cassettes of these two productions are part of the audio catalog of Strawberry Hill Farm Studios and may be purchased separately.

Alas, the section called "Theories and Queries" was not scored because of the tedious nature of setting each note to its specific frequency on a sine wave generator in order to record the more perfect harmonic pitch of each note, most of which were not related to our familiar western scale.

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FORWARD

The reason for writing a book of this sort was determined by the realization that the things in life which are bypassed as of little consequence, have, on the contrary an immense importance to our development as human beings.

This work is a reducing of complexities to a symbol. The symbol is being able to determine our responses to emotion, thought, and psychic awareness. How little we know of the irritations or pleasures which influence our mental states. If we should know such things as sequences, we could predict events. If we should know such things as accelerations and decelerations, we could better understand time. If we could find a way to utilize the energies within us, to direct and focus them, we could be productive individuals.

The ideas here presented could be used as a springboard for an entirely different approach to life. That they should be given a wider and broader audience is based on the realization of the response of many individuals so far to these ideas, and it has compelled me to make them available to others.

They seem to have a unifying effect on those exposed to them, as if the facets of each life have loose dangling strings, and it is possible to pull these together taut. So often our lives are compartmentalized, as is our society. Yet we all long to feel a whole. And if even one of us can make a whole of some of the parts, others are able to do likewise.

Therefore this work is proposing that universal

harmonies exist, that we perhaps have long lost sight of.

These harmonies are most manifest in music and proportion in the arts. If we can take the principals behind these harmonies and analyze them, we not only discover guidelines for the arts, but for living harmoniously as well.

If we can define these harmonies without even using sounds, we can begin to understand some of the principals lying underneath the surface. Once these mysteries of harmonic analysis are uncovered, a whole process of growth, healing forces and aging processes are revealed. Each person following his initial overtone structure, could develop his full potentiality intuitively, intellectually, emotionally. One could expand consciousness through effort of understanding at all levels.

The arts have traditionally been considered an expanding of the mind to the consciousness of the human race. Now, at a crucial point in the development of the arts, where the forces of materialism and an intellectualization of a negative sort are threatening to choke off the life source of creativity, a positive approach, not competing with science but reinforcing this important branch of human endeavor is desperately needed.

The iconoclasts of our age have finally reached a point where everything has metamorphically been smashed, and it is up to all of us to begin putting the pieces back together again.

One thing I wish to emphasis is that GLIMPSES is not merely a collection of diagrams from different

disciplines. A few are borrowed from other works, with credit given, but these have either the music grid framework I developed superimposed on them, or are diagrams juxtaposed to show similarities in shape, or concept alone. Most of the diagrams were devised on my own, sometimes picking up an idea from a verbal description, but for the most part the diagrams developed out of their own system.

There are certain aspects of this work I would like to explain. First, many of the sources were second, third or fourth hand. The reason for this was that having found a framework, so to speak, I was intent as an artist, to see if some discoveries from other fields would fit into this system. The intention was never scholarly, in the sense that I always felt that I was basically an artist, not a writer nor scholar. At the same time, I felt that I wanted to communicate not so much to the expert in the fields I chose, but in a broader sense to a wider public, artists, who tend not to know the semantics of musicology, and the general public.

Therefore, in using terms such as octave, musicologist might have said "diapason" or wholeness. In this case octave meant, seven, sixteen, or even 53 notes within a whole, depending on just what scale we were dealing with. The universal ladder of sounds would be a "diapason", as would the grid of either eight or sixteen points. For the tones I used Do, Re, Mi, Fa, Sol, La, Ti, in place of C, D, E, F, G, A, B, C, or even more precise TONIC or fundamental, Unison (C), MINOR SECOND (C# (D^b)), MAJOR SECOND (D), MINOR THIRD (D" (E^b)), MAJOR THIRD (E), FOURTH (F), AUGMENTED FOURTH (F*), FIFTH (G), MINOR SIXTH (G* (A^b)), MAJOR SIXTH (A), MINOR SEVENTH (A* (B^b), MAJOR SEVENTH (B) and

OCTAVE (C).

The sharps and flats I used wherever they fell on the grid. Since, in most cases the grid only went up to 16 points I only considered the flatted notes, which are equivalent to sharped adjacent notes, i. e., Mib, or D#, La^b, or G[#], TI^b, or A[#]. Also, different from musicologists, I have used distance to determine the note exclusively, whereas, I could have used the relationship of tone to tone determined by ear only, but that would have no bearing on the visual determination of pattern and distance, from the stand point of this work. Also I simplified considerably the whole idea of proportion based on fractions. Since single fraction can be visually determined by using the relationship of the denominator to the numerator i. e. 2/3 numerator/denominator, this was the basis for the work. The "partial", or the part left over from dividing a string, was only used in one case, Illustration P-13. I did not deal with any groups of notes as a harmonic cluster, but the notes would be seen more as a simple melodic line. I did not go into any theory dealing with harmony or counterpoint, nor did I feel the need for using music scores to illustrate certain points. However, I have often thought of the feasibility of stretching strings over a drawing, for example, tuned to the notes involved. Sixteen strings, for example tuned from C2, E2, G2, B2, D1, F1, A1 as the base notes and C, E, G, B, D, F, A, as the treble, where one could trace the outline of the forms, in a direction progressing from left to right and would directly join sound with vision. Also, since the notes I was dealing with could be approximated by the process of halving a string, successively, this also was a simplification to most systems.

I could have used technical terms for the rays of

multiples fanning out from the grid, known as the Lambdoma", or identity rays for each note, named by the Neo-Platonism Iamblichus.

The hexagon or Mi^b could have been called a "senarius", or sixth on the scale, which is our Mi^b, where the major scale ends. Of vibrating waves I only used the "transverse" or up and down, rather than the longitudinal, back and fourth, whereas combining them would have yielded another dimension. I was puzzled over many aspects of seeming contradictions such as the inversions of the fractions I encountered while studying these facets. Helmholtz, for instance, claimed that the fractions with the denominator large were the ascending notes, whereas, Levarie and Levy claim the opposite.

Also the correspondences worked out by applying the reasoning of logic to the I. Ching do not correspond with the numbers given for the notes on page 89 of Danielou's "Traite Musicologie Comparee" where Do is five, Re is nine and four, MI# is eight and three, Fa is not included, as being a tritone, Sol is even and two, and La# is six and one, and Ti is not included.

Both Levarie and Levy, and also Ouspensky hinted at analogies of the octave to the periodic table of elements, but not in any structural way which I could determine.

I would have liked to go into the major-minor modes, and the Greek Modes to compare the scales developed under this system, with others, but as much has been written already on comparative studies of this kind it would have been repetitive and not one of depth, so the best I can do is to cite the sequences discovered under this system, So in essence, taking a very tiny part of music theory, was enough to weave many thoughts, around certain visual problems, and come up with an enormous amount of visual ideas, which could then be translated into words, and perhaps in the future be retranslated into music.

"There are three kinds of music, the music of the worlds, the music of humanity and the music of instrument. Of the music of the worlds, one is of the elements, another of planets, another of time. Of that which is of the elements, one is of number, another of weights, another of measure. Of that which is of the planets, one is of place, another of motion, another of nature. Of that which is of time, one is of the ways and the vicissitudes of light and darkness; another of the months and the waxing and waning of the moon; another of the years and the changing of spring, summer, autumn, and winter. Of the music of humanity, one is of the body, another of the soul, another in the connection that is between them." Hugh of St. Victor (1097-1141) "Didascalicon de Studio Legendi"1

How, what, when, where, why? Questions that we ask about everything. When we focus on one fact, often discoveries are made which bear little relation to what we are absorbed in at the time. This was the case when compiling a lexicon of images, relating abstract concepts of music and art. Suddenly all sorts of ideas seemed to fit into place. A whole was being built up which dealt with phenomena far beyond music or art. Or, perhaps these phenomena always existed in the arts but were veiled to most of us. I call these discoveries GLIMPSES. Perhaps they are only subjective, but I believe they are universal fragments of truth.

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I have decided to focus on the HOW and the WHAT. HOW these forms were constructed, so that others may experiment with them, and WHAT is the significance of these images of thought.

INTRODUCTION

This book, EYES + EARS = IDEAS, is an expansion of the original GLIMPSES and was conceived in the nineteen seventies after having come across Pythagoras' ideas of coding musical notes with corresponding colors. I had been a visual artist since the nineteen fifties, and had been re-studying music for eight years at the New England Conservatory of Music, trying to find a link between art and music. I had come across a book on "Tone a Study of Musical Acoustics" in the early seventies which featured an ancient diagram as a two dimensional matrix which mathematically linked ratio to harmonic intervals in music. By combining the color coding of ratios of notes by Pythagoras and the Lambdoma matrix, I was able to translate from color to musical interval in a new art way for me. I am convinced that Pythagoras knew of the Lambdoma matrix as it was predominately used in ancient Greece.

After going back to each image, which were drawn on a treated canvas called "primac", I began to express in words what I had been thinking visually.

The comments are based on the same insights I had while making connections between the intervals, notes and ratios while drawing. This work of pleasure shows the beginning of a long journey toward the fuller understanding of what is called the Lambdoma.

Later in the seventies I wanted to create a music score for each drawing. For the section called "Start Stop and Think" a flutist played the painting/drawings at a solo exhibit at Max Protecht's Gallery in Washington, DC.

I then took a seminar at Robert Ceely's BEEP recording studio and wrote and recorded the scores from each drawing of the section called "The Other Side of Art" on a moog and mini-moog synthesizer.

If the viewer/reader maintains an open mind, there are some insights which might be a spring board to others to further explore this fascinating path.

Barbara Hero (December 1993)

¹ Hugo of St. Victor, "Didascalicon de Studio Legendi"

GLIMPSES

MUSIC OF WORLDS, HUMANITIES, INSTRUMENTS. (RE: ILLUSTRATION # P-1).

This illustration shows one way we can interpret thoughts from a written page, and translate these ideas into pictorial symbolic form. Three suggests three objects. Since the world is a sphere, circular forms become the next step. Since elements, number, weight, measure, planets, place, motion and nature and time all fit into one sphere, we can almost conceive of wholes within wholes, the sphere of our visible world. The music of instruments, however, suggest the invisible world of vibrations, solid hitting solid, to give off vibrations in the spaces between the objects. It is here where we find patterns of sound, always following the same sequence of fundamental, fifths, fourths, sixths, thirds, sevenths and seconds, which when rendered pictorially give us much to think about.

The music of humanity in essence is the body, the visible, and the soul, the invisible. The connection between them is the reaching of the visible, or material, for the invisible, or spiritual.

This describes what we are trying to do, specifically in life, no less than in art, uncompleted beings searching for fulfillment.

The lines are the five lines of the music staff at right angles. The right angles assumes importance as we go on, as do the differing degrees of angles, as we shall see.

So do the circles within the circles, and the rims of the

circles meeting at the center. If we can imagine the circles all rotating, we know, from mechanical laws that the inner ones must go in the opposite direction from the outer ones.

Light and darkness also can be depicted to show opposites, by making what was light in one, dark in the next, symbolizing the juxtaposition of the known and the unknown. In all three cases the inner circles were different, rims meeting in one case, then turned at right angles in the next, and finally both coming into the whole at the same time, superimposed over one another and giving the impression of a backward forward motion, pulsating.

The smaller to larger spheres in the foreground stand for the notes on a keyboard. (Do) or the tonic, becoming the middle (C), one side of middle (C) representing TIME, the other side representing SPACE. The descending scale represents contraction, as we shall see later. The earliest known music, incidentally, had the scale descending step by step, rather than ascending as we know it today¹. Could it be that in an expanding contracting universe, ancient civilizations were in a contracting phase, whereas now, with present emphasis on overtones, ascending, time and all we know and experience is expanding?

The ascending scale represents expansion, not only because of the patterns of notes when laid out on a numbered grid, but because of decreasing radii (the overtones can be reproduced by shortening the string length or radii) and the fact that we are dealing with an infinite, in the sense that we have an ever increasing set of numbers, rather than a given length. Thus the descending scale represents the finite, the ascending scale the infinite.

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The N. S. E. W. directions were used because we could then determine where the notes were in relation to one another.

The Chinese are apparently the only culture which assigned direction to their musical scale. Since they also assigned color and taste in some instances, that is another reality, we can make visible.²

This Illustration does not deal with specific instances of making musical ideas visible as much as showing the relationship of an art to everything around us, material and spiritual. It suggests a receptive frame of mind which the viewer or reader might assume to gain the most benefit from the work.

A work of this sort is not aimed only at those who see or hear, but the physically blind and the deaf should also be able to understand and experience these abstract truths, and benefit with the same esthetic enjoyment of discovery.

ORBIT OF PLUTO. (RE: ILLUSTRATION # P-2). Pluto's orbit is in an ellipse. While all other planets have orbits with the sun as center, the orbit of Pluto has its center off from the sun. We know that we need two points to draw an ellipse, and in space two forces are needed to create an elliptical curve. The sun is at one focus, the other is empty. The idea was intriguing so this was the model used for relating the notes of the scale to the planets. Pluto represents the limit to the circle.

The smaller, more dense rings symbolize the four planets nearest to the Sun, Mercury, Venus, Earth and Mars or (Fa), (Do), (Sol) and (Re). The asteroid zone, or

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(La) is between Mars or (Re) and Jupiter or (Mi), the largest planet, but the limit musically, which we shall discover later.³

The five outer planets, Jupiter, Saturn, Uranus, Neptune and Pluto, or musically (Mi), (Ti), (Fa[#]), (Do[#]), (Sol[#]), (Re[#]) and (La[#]), represent unknown planets⁴ then become almost an inversion of the planets nearest the sun, and enlarged inverted mirror images.

By far the most significant aspect of this is that there might be a relationship between the planets and sound, that the furthest planets from the sun might be an enlargement in scale of the planets nearest the sun. We know from astronomy that there is a tendency in the universe to change its scale by expanding or contracting.⁵

What is important is the laws of proportion. No matter what the scale, the objects we are measuring are always in the same relation to one another. Could we apply the same laws of measurement to the macrocosmos and the microcosmos? No. The universe is finite or infinite depending on the measuring rod. In the case of a contracting universe we could use the finite measuring rod of dividing a given whole. In the case of an expanding universe, we could use an infinite set of points, always adding or multiplying an imaginary radius.

Musically, Pluto as Sol[#] could be taken to mean the earth. Musically, Jupiter, the largest planet, symbolizes the limit at (Mi). (Mi^b) could mean a contracting to Mars or (Re). Jupiter is, at the same time one of the largest and the lightest of the planets. Pluto is, at the same time the smallest and the most dense. Are vibrations faster in increasingly dense material? Would the most dense of all musically be the (La), whose ratio to (Do) is 32000:19683? If asteroids are most dense, could not the ancients have been valid in thinking of the asteroids as far away stars?

I bring all this out to show how by focusing on one aspect of any problem leads to conjectures about other problems, conjectures which are stimulating to the mind but harmless in that they are not applied to astronomy or physical planes, but reflect perhaps a motivating creative state of mind that is necessary to all creative thought.

Let us see what would happen musically if we took the notes in order. Up to (Fa), down to (Do) up to (Sol), down to (Re), etc.We have an ascending, descending pattern, which also resembles a zig zag which according to P. D. Ouspensky symbolizes the fourth dimension.⁶ Since ascending represents expansion and descending represents contracting, we have a picture of time, expanding and contracting, ascending and descending in a zig zag.

Musically, the note on a keyboard of middle (C), represents the zero point; a balancing of ascending and descending steps, a see saw like image, the (Sol) ascending and the (Fa) descending making the widest angle, whereas the (Re) ascending and the (Ti) descending make the smallest angle. Think of the see saw as the diameter of a circle. Think of the circle as being a limit of the universe. Think of the half of the diameter as a radius, and the rate of acceleration or deceleration being dependent on the degree of the angle. Think of life processes as going forward in a leap of five steps, then going backward in a leap of ten steps. The octave between (Sol) and (Sol), then all the other oscillations are shorter and shorter leaps, until there is finally at (Re) and (Ti) one step up and one step down. Every effort has it backsliding, it is a natural process, activity and passivity or receptiveness, the giving and the taking.

If we imagine (Do) as the center of a circle, and draw rings, one for (Re), one for (Mi^b), a larger radius, one for (Mi), still larger, one for (Fa), (Sol), (La), TI^b), (Ti) and (Do), and imagine all of these rotating at different speeds, along a flat plane, we have a very good picture of the solar system, or even the rings of Saturn. As for the construction of the rings, an optical illusion occurs when concentric rings are drawn around a center point.

They either seem to be solid/space or vice versa, space/solid. We can utilize this in drawing, by rendering it three dimensionally, but we do not even have to do this as our own vision supplies this balance optically.

The spheres are given a three dimensional effect by shading, size difference, and shadows so that they appear to be standing on a drawn surface, as an extension of the surface into another dimension. The numbers 4, 7, 10, 15 represent the number of units of each planet's distance from the sun, and are an approximation of Bode's law. In the system presented here the relationship is that the smallest planet Mercury as (Fa) which is FOUR units from the sun, Venus ((do), SEVEN units from the sun, Earth (Sol), TEN units from he sun, Mars (Re), FIFTEEN units from the sun, Asteroids (La) TWENTY EIGHT units, Jupiter (Mi) FIFTY TWO units, Saturn (Ti), ONE HUNDRED units, Uranus (Fa*), ONE HUNDRED NINETY SIX Units, Pluto (Sol#) THREE HUNDRED EIGHTY EIGHT UNITS and Neptune (Do*) SHOULD

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NOT BE THERE ACCORDING TO BODE'S LAW.

Certain questions come up, such as why do we come to a limit at (Mi) and (Mi^b) JUPITER & MARS? (See illustration 48 Concentric Circles). Why is it that in the entire universal ladder of sounds we always hear only the notes we can attach to seven planets, and when we are dealing with one portion of a contracting field of the circle of fifths, we don't find or hear the note in question.

(Do) would be the fundamental in its field, (Sol) the fundamental in its field, etc.

DOUBLING UNDERTONE, DIVIDING OVERTONE, (RE: ILLUSTRATION # P-3).

We know that overtones can be produced on a string by holding the string at midpoint, for the first overtone of an octave above a plucked open string, and halving each section until it is no longer possible to differentiate the note, and the finger reaches the end of the string. This occurs in about four or five steps on a violin string, for example. Since the undertone is a doubling instead of a dividing of the string length it is impossible to physically reproduce. In the case of a vibrating string, every other harmonic in succession does not vibrate, so what we hear are the first harmonic, the third, the fifth, the seventh, etc.

I would like to put forth the idea that what is <u>heard</u> in the overtone series, is not necessarily the whole, but only a fragment, that there are vibrations occurring which we do not hear, but which we know are there because their numerical ratios appear on the framework we have set up. If we take the idea of ascending and descending fifths, fourths, thirds, seconds, we find that their counterparts descending are fourths, fifths, sixths and sevenths. This pattern of taking ascending and descending notes on a keyboard fits exactly into the pattern of notes as set up on the grid.

The visual pattern of this maneuver is a zig zag, a shape integral to our thinking. The slanted diagonal lines fit into our puzzle, as being the fold lines created when we fold each circle to its corresponding size. They represent the slanted lines which originate from multiples of ratios on a fraction grid, where the numbers fan out on each side of the 1/1, 2/2 etc., diagonal lines.7 Lines drawn from the most dense galactic sources to other galaxies also have the same type of arrangement and slant, as do spectral lines. They appear to fit into a 60 degree angle, an angle which is germinal to our thought. They also form the basis of triangular shapes, which are sectors of circles. The circles are to be thought of as moving orbits. The angles are shorter or longer radii, contracting or expanding. Vibrations are to be thought of as traveling along adjacent circles, up and down, ascending and descending. Every circle is part of a wave motion. Every spiral represents a falling out of one orbit into another.

How does this apply to our lives, or other phenomena? If many waves can occur on a fixed length of a vibrating string, many universes could exist within a given finite space. Astronomers are unable to find what exists beyond the galaxies beyond our own Milky Way. Let us say that beyond our galaxy is the tonic or fundamental tone of the universe, the (Do). The next layer, a smaller sphere, our own galaxy would then be the dominant, the (Sol),

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the plane on which our star exists. The third harmonic, descending to a smaller scale, would be (Fa), a musical inversion or (Sol), or the earth. The next overtone is (Mi), or mankind. The next is (Ti^b), or organic life, or microbes. Then comes (La), or space. Finally at the end of the cycle comes (Re^b), or energy, expanding. After the expansion we would come back to the fundamental (Do), the largest circle, the all inclusive wave, and begin all over again the reductive process of contracting to different scales. If we imagine each sphere lying on a different plane, and that each one as viewed from another dimension is flat, we can picture an extension of dimensions, from each plane.

We would also have to assume that the tones heard in each sphere would all be present except the tone, the fundamental tone of each. So that in each sphere would be missing the sound of its own tone, and would be incomplete in that sense. A conscious intelligence in any form would long for the missing vibration, the missing sound. And we as human beings are searching for the missing piece, to the puzzle.

THE MAYAN KATON WHEEL⁸ (RE: ILLUSTRATION # P-4).

The most significant thing about the Mayan Katon Wheel relevant to this study is the curious shape the counter-clockwise motion takes across the diagonal of the wheel. The wheel was divided into thirteen sections. The thirteen sections represented a 20 year period. The pattern of notes on our grid up to the 15/ 16 point, a completed cycle of (Do) to (Do^b), an octave, can fit into this circle. In other words we can take the thirteen notes on the grid, and place one cycle on another, to come to rather similar conclusions.

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If we look closely at the structure of the zig zag eleven pointed star, we can easily determine that three of these pointed figures form a 60 degree angle, and if magnified to the scale of the previous illustration (#3), would also correspond to the fold lines in that illustration in both angle and number of lines. This wheel might help to explain the recurrence of (Mi) on the grid, because at this point a reversal of direction appears to have taken place. If we turn back to illustration #2, we see how this happens. The snakelike pattern of planet to planet progresses until we reach the asteroid zone where perhaps a missing planet area causes a reversal of sorts. This may seem very arbitrary and unjustified speculation now, but when the same phenomena appears to occur at the exact same point in every system that we use, there must be some reason for its recurrence (See Circle of Fifths, Trapezoids).9

As we have already shown, the (Mi) and the (La) represent ascending and descending properties of the same note. (La) is a descending third, (Mi) an ascending sixth.

One is a stepping up from the bottom step. The other is a stepping down from the same step on the ladder.

Again, the significance of this is applying a cultural analogy to an abstract theory.

However, on a grander scale, it represents spiritual powers of a search for absolutes, and making these absolutes concrete. The importance of it lies in the search of a meaning to the universe, a meaning to our lives. A placement of all of our values on something greater than ourselves. Symbolically it represents a shedding of material values, to a putting on of values that correspond to a universal harmony. It makes us acutely aware of the knowledge and the search of other ages. It gives us an insight into the thought processes of other civilizations. By focusing on a fragment of an unknown puzzle from another age, we respect the mind, and feel a link not bound by time.

In fact, it makes us almost think that civilization is slipping downward, that perhaps the golden age of man did have all the answers, that somehow mankind forgot some of the basic motivating and universal laws, that the Garden of Eden was a reality, and mankind has slipped backwards ever since.

VIBRATIONS OF A STRETCHED STRING. (RE: ILLUSTRATION # P-5).

(When this was drawn, it was an example of how vibrations might be depicted on a string. I have set it up according to the grid sequence rather than the acoustical way it is heard, as it is depicted in most cases.)¹⁰

I would like vibrations to be thought of as waves traveling along in any space until they reach an object and must bounce back. When they bounce back the waves would seem to fall in the spaces between the original wave. Where there was originally a trough, there is a crest, Even in stars, scientists have found that vibrations from small to large cannot be reversed, and that in the interior of starts are found the short wave lengths, at the surface of the star the length is longer.

As the outside of a star or any body is a positive curve, and the inside of any body is a negative curve, if we draw adjacent circles we can see that lines drawn perpendicular to the slant of the surface implode on the inside, come together, and explode on the outside. A star, as an example of a closed body of negative curvature on the inside, any sound or pulse or striking of object against object would produce, it seems, waves which would produce the whole overtone system as they bounced back and fourth, becoming multiples of the original wave.

If we apply this idea to the notes as set up on our grid, we find that the first space between comes between the (Fa),MERCURY and the (Mi) JUPITER at 5/3 or (La) ASTEROIDS, so we can imagine a wall of sorts at the asteroid zone where sound bounces back, travels in a reverse direction, as if it were on the inside of a star and hits other waves so that the whole line of vibrations becomes increasingly complicated because of the reverberations.

These reverberations can also be depicted in another way by setting up circles along a line, then dividing them by halves so that within the radius of one, another is drawn, or two circles within one for the (Mi) YELLOW within the (Fa) GREEN. Within the (Mi) is the (La) LAVENDER and within the (La) is the (Ti) BLACK and within the (Ti) is the (Re) ORANGE. While to go bigger we find two (Fa's) within one (Sol), and finally a gigantic (Do) enclosing all. Just to give some idea of the dimensions we are dealing with in a rough approximation of inches, the smallest (Re) would have a radius of 3/8ths of an inch. (Ti) would have a radius of 3/4ths of an inch. (La) would be 1.5 of an inch. (Mi) would be three inches. (Fa) would be six inches, and finally (Do) would have a radius of twenty four inches. In another way of putting it, each succeeding radius of a smaller circle becomes the diameter for the radius of another circle. We have reached very huge dimensions, proportionally taking

in just seven steps. These seven steps represent an example of an entire scale, a universe of the physical things within a human's grasp, so to speak. The objects we deal with, in a day to day existence, the familiar world.

We might say that within a given length of 48 inches the diameter of (Do), we have a universe of vibrations which is complete within itself, a finite measuring rod of proportions such as these, in our houses, the objects we use could all be designed with proportions such as these, in differing scales, we should actually be living in environments of harmonic proportions, which would undoubtedly influence our states of mind.

We could be enveloped in an esthetic harmonic law, which could have unparalleled benefit, purpose and usefulness, for our activities as productive individuals.

Each of us has a special tonal signature, the tones are different, like the twelve months, the overtones are different, but all follow a similar pattern. It is this pattern which we are attempting to isolate, analyze, and put to use, as a means for fulfilling our destinies as individuals and as members of an evolutionary process which is unfolding in harmonic order. Even the membrane of the human ear takes certain wavelengths and distorts them to a different scale in order to interpret for the brain the meaning of certain sounds. Perhaps we, as individuals, are cosmological membranes to a greater order. Perhaps the asteroid zone is a cosmological membrane of our solar system.

MACROCOSMOS MULTIPLY - MICROCOSMOS DIVIDE. (RE: ILLUSTRATION # P-6).

This image suggests inverted cone shapes, which we

obtain when trying to encompass expanding circles. If we deal with diminishing circles, by taking a 60 degree angle radius of each circle, we find the inverted cone shapes becoming increasing smaller. Also they become increasingly diminishing progressions by squares placed end to end. This is one reason we think of squares being two triangles fitted together, or even better, two sectors of tangent circles. This is part of our puzzle, that we see each shape as part of a larger whole. We also reach our limit at Mi^b as expected. In illustration 6 the notes were set as planets, in the progressing small to large scale as their distance increased from the sun. In this illustration they are not inverted at the point where the cones meet, but are placed in the opposite order, to show that if the paper or space were folded over, we would have a true reverse. It is at the zero point where the object seems to contract, in order to expand at the other side. In music, as described here, we find (Mi), the most contracted, the zero point of all the other notes. As (Mi) is Jupiter, in this system, the largest planet, perhaps we see a magnification of a nearer planet, say Mars. The asteroids would then become a magnifying mirror to our first four planets, MERCURY, VENUS, EARTH and MARS. The important thing is not all of these conjectures but the idea that when space is folded over, all the small orbits fit into the larger. Space is supposed to curve more in the vicinity of more dense matter, Pluto, as the most dense planet, would be in the most curved space, perhaps even turning over itself. Pluto, is the furthest planet from the sun, the periphery of our solar system, yet it is the focal point or center of our drawing. Could we imagine space to be curved over to such an extent that it becomes a 60 degree angle.? If so, we can picture a funnel shape. The funnel shape, in turn suggests that contracting principal, as opposed to a diamond shape,

its opposite, an expanding shape. If we can imagine six funnels radiating from the focal point, a hexagon shape, this gives another dimension to our thinking. Even, more so if we think of the center point being at Pluto. If we fold over 1/2 the distance from 1/2 to 1/32, Pluto and Mercury become one and the same. Is Pluto a mirror image of Mercury? Mercury is (Fa) in music. (Fa) is the starting point of the circle of fifths, the "I CHING" diagram where (Fa) 81 (9 x 9) coincides with number one in the sequence of unfolding Hexagrams.¹¹

SPIRAL GALAXIES TO QUASI STELLAR SOURCES ¹² (RE: ILLUSTRATION # P-7).

We know that density is proportional to the frequencies of vibration. We also might consider that the degree of angles determines the speed. When we apply an idea of density to a diagram of galaxies, we can take what is thought to be the most dense source in the universe, and draw lines from this to the other galaxies, to see what patterns might appear. Also if we consider that at right angles motion stops, we can start with (Do) at right angles to the most dense source in the drawing. We find very regular intervals, which lead us to compare these with the pattern of the grid. The galaxies seem to be as pulses of differing intervals apart, much as the pulses we would find by multiplying the fractions of 2/3, 3/4, 4/5, etc. The galaxies are spaced in neat little rows, six to be exact. If we can imagine these galaxies as notes of a musical scale sliding to a focal point, imploding perhaps until past the zero point where implosion becomes explosion, perhaps some of Einstein's ideas of relativity might apply,¹³ i.e., the faster an object goes the smaller it becomes. Even on a diagram as rough as this, we can tell that each parallel section appears to be

either a doubling or a halving of the one either preceding or following it. This might be a principal which we could use in designing a structure, alternately multiplying and dividing, or adding and subtracting, it would be built in measuring rods wholly dependent on adjacent parts, and balancing in proportion of one to another, its neighbor. If we can imagine an accordion pleated fold at each dotted line, we in essence have a straight line, extending diagonally across a given minimum of space when folded and fanning out two dimensionally at right angles to the diagonal when unfolded to its maximum. Again a right angle is extremely important to this study, as an immobility of motion. To go back to Ouspensky, any angle greater than a right angle is IMPOSSIBLE MOTION. These folds cannot become greater than a right angle. This is why we assume that the right angle is the limit, and that it fits perfectly into this particular diagram. The fact that there are thirteen folds reminds us of the Mayan Katon Round Calendar.

COLOR SPECTRUM MUSICAL INTERVALS PLANETS. (RE: ILLUSTRATION # P-8).

If we imagine the planets, or notes, swinging around in a circular line, in a chromatic color wheel, we have (Do") as Venus, (Re") as Mars, (Mi) as Jupiter, (Fa") as Mercury, (Sol) as Earth, (La) as Asteroids, (Ti) as Saturn, and (Do) as Venus again.¹⁴ We not only have a serpentine-like form biting its tail, but it might be easier to imagine why ancient people thought there were two Venus', the morning and evening stars, and why music and the planets might have seemed more connected then than today. If we carry our imagination on even further to imagine that this circle is an ever bigger inner tube, what would the tube universe look like to those on the inside versus those

on the outside? Does the inner eye look inward to the tube?

CHINESE COLOR MUSIC SCALE 15 VS. PYTHAGORAS COLOR MUSIC SCALE, ¹⁶ (RE: **ILLUSTRATION # P-9).**

When comparing the notes and their colors it is interesting to study the differences, and wonder why, with the exception of (Do) ORANGE and (Do#) ACRA VIOLET, the colors the Chinese assigned to notes are the exact opposites (Complementairies). When taking each row individually, the Chinese sequence follows a complementary pattern, of radical change from (Do) ORANGE, to (Re) GREEN, from (Mi) LAVENDER, to (Fa) RED, then the sequence becomes one of adjacent colors after (Sol) YELLOW to (La) BLUE. (Ti) is WHITE the opposite of the Greek (Ti) BLACK. It is only the two (Dos) which are the same in both systems. The Greek system from the same notes of the scale follows a chromatic color pattern, one of gradual change to neighboring notes, rather than the sudden dramatic change of the Chinese. The Greek being RED to ORANGE to YELLOW, to BLUE-GREEN to BLUE, to LAVENDER, to BLUE-BLACK, to ACRA VIOLET.

The curved lines within the circle show how we can interpret the ratios two to three by having three crests and two troughs. The idea that the sound varies from rhythmic below 10 vibrations per second, to melodic above 15 vibrations per second, is akin to the idea that the same string length encompasses all the multiplications of vibrations. In other words melody and rhythm have the same base, the only difference being the speed or the number of vibrations.

COLOR NOTE VIBRATION SCALE. (RE: **ILLUSTRATION # P-10).**

If we maintain a constant length for each note and whatever the ratio is, such as an eight to nine, (Re), if the whole length is taken to be nine, we measure nine equal segments, and then count off eight on the length. When we arrange each segments in an order of gradation, and make one an inversion of the other by hanging it upside down, as it were, on the opposite side of the paper, we find that the so called unstable notes cluster together, as a measure of space, perhaps, and the others, the (Do), (Sol) and the (Mi), the stable notes, which might represent time.

In the center of the drawing, the tiny spheres are arranged as if on a keyboard, with (Do) being five steps from one end, and eight steps from the other end. It is this keyboard arrangement which points out very clearly the ascending-descending quality of the notes, as if they were being played. One significant thing about this is that the shape that is formed in the center of the paper assumes the configuration of a pseudo-sphere, a bone-like shape which to our way of thinking becomes the space between two circles. This again, is an important aspect, as either one can be alternately space or solid, but not both at the same time, as emotionally our reactions to the latter is very unpleasant and confining.

We should imagine the lengths vibrating, as if the crests were electric energy, the troughs, magnetic energy.

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COLOR NOTE VIBRATION SCALE. (RE: ILLUSTRATION # P-11).

The vibrating strings in illustration #10 should be seen as being placed together so as to form a circle, a half circle, more precisely as the other part represented here is but a mirror image. If one part represents an ascending scale, and the other a descending scale, we already have a concept which is most important to understanding reversals, and another integral facet of music. One of the things that has stood out in our study is that we really only have to deal with one half of a circle, in almost all cases. here, the eight segments form a half circle. Within the vertical segments, we must imagine a wave traveling up and down. What is outside becomes inside as we can very clearly see, if we just draw lines extending from the crest, and as we follow it, we see that the lines must become inward and at different angles at each point. We now have a frame of reference as to the originating point of lines radiating outwards from the OUTSIDE OF A CURVED SURFACE. We have explained to ourselves visually the reason why we don't come to a point when determining the slant of the multiples on a grid. We can see a picture in our minds of curve of a wave of vibration from which radiate other vibrations at different angles. The reverse of this is, of course, the trough. The crest might be considered as an extension, an expansion, the trough must be thought of as a quickening, a contraction. Why not make these pulse beats? Rhythms? From space we have time. The line is very thin. Space can be translated into time.

FIELD OF OCTAVES OVERTONES-UNDERTONE. (RE: ILLUSTRATION # P-12).

Can we apply a universal field theory of octaves of

music to a flat two dimensional surface? In nature we find a leaf flat, the entire solar system flat, the rings of Saturn flat, galaxies flat. A whole field of sound waves is like two pebbles dropped in a pond. An octave, a (Do) at the beginning, RED. A (Do) at the other end, ACRA VIOLET, double the vibrations, and a shorter length, the rainbow, a spectrum of RED through the full range of color to RED again at the violet end.¹⁷

When we arrange fractions¹⁸ in an order at right angles, and each point representing a fraction spaced equidistantly apart, if we study carefully the differences between the horizontal 1/2, 1/3, and 1/4to the vertical 2/1, 3/1, 4/1, we find that there is an immense conceptual difference between the value of the fractions which lie along the diagonal 1/1, 2/2, 3/23, (representing a whole), one being much less 1/2than a whole, the other being much more than a whole 3/2 or 1-1/2. Yet the large difference diminishes towards the end, and 8/9 being closer to a 9/8 in distance. So, in other words we picture simultaneously a diminishing cone IN BOTH DIRECTIONS, or a complete picture of an expanded body, two triangles base to base. This can be described three dimensionally as an enormous fold diminishing as it runs diagonally across a sheet of paper, or SPACE ITSELF. If we think of the notes as planets, we imagine the fold with a reflection of a planet on the other side, as on another dimension. Perhaps the square paper or space does not exist as a square but only as two triangles fitted together to form a square. If we imagine other folds, at right angels to the diagonals between each note, we will have thirteen folds in one cycle of (Do) to (Do). Only two pebbles, two planets, thirteen folds, thirteen reflections of mirror planets, the MAYAN KATON WHEEL.

There is another thing we can do in analyzing this field of notes, if we try to apply some of Einstein's theories. Since we have established a pattern, let us see what might result if we take the large spaces, such as the empty area at the end of the series. Einstein, in effect, brought out that at vast distances, (relatively speaking) speed increases, length decreases, mass increases AND TIME SLOWS. The idea of objects shrinking in vast spaces, we can apply here, because the area of the empty space is twice as big as the whole cluster of notes in the areas up to 8/9. The ratios also become smaller, as we have seen. As 15/16 is the end of the first cycle, we can imagine the pulse slowing, as the speed increases. It is much like our view of waves breaking in slow motion on a shore, when viewed from a plane.

The idea of mass increasing is also proven by the note (Do) being both 1/1 and 1/2 and 15/16 being closer in size to 1/1 than to 1/2. It is important to state here that Helmholtz believed the descending notes to be 2/3, 3/4 etc., while ascending notes became 3/2, 4/3 etc.¹⁹ The idea that the more massive an object the more sharply spaces curves around it, could be illustrated by the orbits ever expanding in both directions from (Do) 1/1 to (Do) 15/16. The fact that the ratios go from 1 to 1/2 is a rather drastic shrinkage, then to lesser and lesser shrinkage until they reach 32000/19683 end of the cycle at (La). If it is possible that the snake-like progression of the wave are at right angles to the diagonal in ever increasing crests and troughs until we reach 1/8 on the grid, which includes the (Mi) Jupiter area of notes (the mediant, the halfway point between (do) and (Sol)), we might have a little picture of the universe forming before our eyes.

According to some music theory, at the 1/8 point we have an undertone, rather than an overtone, in which case the notes which lie on the vertical line of 1/8, 3/8, 5/8, 7/8, 8/9, and 9/16, we have the notes (Fa), (La), (Re) or (Re^b) and (Ti^{b)} our unstable notes, no less.

We are able to construct another focal point, by taking 9/16 (Re) (Tib), and by drawing with the compass lines from the 1/8, and through each note which lies on the plane of 8, we may construct a rainbow-like structure, which could be proved mathematically to be an increasing-contracting radii, according to a system we already set up for measuring lengths, with the largest space being near the focal point. Compare this to the series of rings we put around the five notes, (Do), (Sol), (Fa), (La) and (Mi), the cluster which represents mathematically an expanding/diminishing syndrome, because of the rings clustered toward the focal point. As mass increases, time slows, speed increases, length decreases, the more sharply space is curved. Perhaps it is at this point where space folds back upon itself. Think of this tiny cluster of notes forming an octave, which is a universe in itself, and might mirror the universe in which we find ourselves. If matter, or length, diminishes, and decreases as time slows, might not the (Ti) notes, with their astrological counterpart as Saturn, a contracting element, be a rather logical conclusion. One might picture the pattern of the (Ti) notes as four black holes in space in the shape of a trapezoid, as the ultimate end of contracting matter.

If we can find a measurement, a scale, into which each contracting cluster of notes, octaves, actually fits, the implications become enormous. We would be able to predict growth patterns, physical phenomena, possibly behavioral patterns, the list is endless. We have discovered that we can fit the whole universal ladder of sounds into chunks of octaves, decreasing by halves, and in a definite order. "See circle of Fifths, Article "Painting Based on Relative Pitch in Music."²⁰ If this ladder of sounds does mirror our universe, we might have found a key to unlock its mysteries.

A possible explanation for the reversal at (Mi) 5/6 or (Mi) 27/32 ($3^3/2^4$) might be that in the progression by squares, the fifth square 25 (625 is a cubed image in the drawing) encloses the entire space of five trapezoids, (see illustration). In a circle divided into nine sections the 5/4 also becomes a reversal.²¹

FIELD OF OCTAVES OVERTONES UNDERTONE. (RE: ILLUSTRATION # P-13).

Do the vibrations roll along the diagonal parallel to it, or at 60 degree angles to the diagonal, which form equilateral triangles at any point we choose? As the area gets bigger we find that the base of the trapezoids progressively curves more and more. Would we not find that on increasing even further we might come to a full circle? This illustration shows roughly how, if we put our finger on a point along the vertical, we can stop the harmonics of that note. The fact that each sphere represents an octave of a note, that each sphere can be (Do) in its own little realm that each sphere is constantly moving and shifting, not only within its own 60 degree segment, but that the whole circle is moving, each band representing a different speed, or a reverse motion, that some come in conjunction at times, in opposition at other times, how easy it becomes to find analogies with planets, electrons, calendric calculation.

It is this page which is the key to all of our calculations

to determine a visual pattern of notes. This is the THE GRID, so often mentioned. The sequence of overtone and undertone notes is laid out at the bottom of the drawing. The fold lies represent space folding between each note, so that the image is not of notes lying on a flat surface as much as of notes on the surface of rippling water, or even deeper folds of unknown depth.

<u>SPACE FOLDS ON A FIELD OF 64 DOTS.</u> (RE: ILLUSTRATION # P-14).

If we think of these dots as representing galaxies, although the spaces involved is, of course, much greater in reality, (it cannot be depicted, in fact graphically) and fold the space over a point between the dots, and then repeatedly fold at the base of each succeeding triangle six times, we end up with one galaxy. As we unfold, we find we have three galaxies, in the next triangle, six in the next, twenty eight in the next, or if we overlap into the other side we have thirty six, the whole number of (Sol). The total number of dots or galaxies is sixty four, the number for (La). What is important here is that we have established an order, and a proportion from which we can determine many things. The scale can be any size. What ever scale it is, big, medium or small, the same order applies.When we examine the dots along each side of the diagonal, we find that on one side of the diagonal there is only one dot at the mid point. On the other side, however we find three. One of Einstein's theories was that time is represented as the fourth point of space, space having three dimensions, time one. When we go back to the symbols which represent the notes, (La) is the entire half of the diagonal folded over. (La) represents one of the I Ching deductions, which we go

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into later. When we fold the remaining triangle over one half again, we have sixteen dots, representing 9/ 16 or (Ti), followed by (Re), Mi^b), (Sol) and (Do). These fold lines are remarkably similar to those which we discovered when laying our a grid pattern. The importance of this is in applying a logic of a different sort to a pattern of dots, and making analogies to other things which in turn suggest other analogies etc. We have the whole feeling of chinks of space folding over and disappearing, diminishing, until we arrive at (Do), where the process reverses and begins to unfold, until it again reaches (La), the void.

(RE) EXPANDS. (RE: ILLUSTRATION # P-15).

Here, again, is an example of an ascending scale representing mathematically a diminishing, (going from the outside to the core), and a descending scale increasing (going from the inside outwards). When these two rings are superimposed on one another, coming from both (Do's), in the center we find a large core, the musical note being at this point a (Re), an expanding factor. Even the notes follow a curved surface in this case, as a curved grid was used rather than a grid at right angles. In essence we have what appears to be a hollow sphere. The orbit on which no note falls is cross hatched, adding still another optical dimension to the sphere. The things which appear to happen when circles intersect is curious. On a larger scale there would be a shifting from one circle to another giving an impression of expanding and contracting or exploding and imploding. If we make it appear that there are spheres or lines traveling along these wave-like intersecting circles, we have indeed a sense of motion, journeys in space. It also gives a visual picture of both particle and wave motion simultaneously.

PASCAL'S TRIANGLE. (RE: ILLUSTRATION # P-16).

This illustration shows how we can take one order. such as a triangle, and by using the numbers as axii on a square framework can come up with other patterns, other shapes. The most significant part of this diagram is to show in detail the mathematical cycle of the circle of fifths in music, to show how the numbers for the notes originated.²² It was sometimes thought that the numbers might have been the number of strings wound around one another to yield a certain musical note. So much of the origin of this is obscure, that we can only conjecture more. The interesting thing about the cycle is that we must increase by adding and alternately diminish by subtracting the actual number of strings. Thus a perfect balance is set up for the entire cycle. The pattern of notes becomes a zig zag, our symbol for TIME.

George Arnoux also brought out the interesting fact that 80/81, the end of the cycle, representing (Fa) or when put into decimal form yields a descending series of numbers, or we could call it a descending scale, an infinite series. Whereas an 81/80 yields a finite series of 1.0125. We have determined that a descending scale is finite, since it represents a given length. Perhaps it is the inversion of 80/81 to 81/80 which we should consider. Actually the drawing to illustrate this principal was upside down from the other.²³ This is a pictorial way of illustrating an inversion. The sequence of numbers and notes is extremely important. As we have already mentioned if we know sequence we can determine growth patterns. Remember that this sequence is the same for the I Ching sequence of the second world order, and that it is also the same sequence as the natural order of the planets in our

solar system from the sun.

Some of the cardinal points of sequence would be therefore, FIVE Steps Ascending, or 1 to 5, or one plus five, FIVE Steps Descending, or 1 minus 5, alternating in a balance like a huge pendulum swinging wildly, and then running down to no motion. If we investigate pendulum motion, we come upon some fascinating principals which we can apply. The first might be the wide swing of the pendulum which would take on an elliptical elongated curve, we come across this type of curve in the areas of intersecting circles, which we have called cores. We are not speaking in terms of energies, as the widest swings incorporate the most energy. We are also incorporating the image of circles. If we then incorporate some of the ideas of angles or radii of circles determining the energies, to the diameter of circles, as representing the distance covered, we have a motion. The perfectly round circle represents motion as rest, and we can easily think of the planets as nodes of a gigantic universal string, as the points of rest. This is similar to the same string we press to arrest certain harmonics. This might explain why we could not hear our own tone, why each field in the universal ladder of sounds does not include its own fundamental tone.

SPACE FOLD CHART. (RE: ILLUSTRATION # P-17).

Trying to translate the fractions represented by each note into time values, through a comparison of mathematical proportions, is perhaps a way of coordinating distance with time. By taking a line from one to sixty indicating seconds, we do not begin to have fractions which correspond to the music ratios until we count 30 seconds, or points.

1 15 30 45 60

30/60 would be 1/2 or (Do). 40/60 can be reduced to 2/3 or (Sol). 45/60 can be reduced to 3/4 or (Fa). 48/60 can be reduced to 4/5 or (Mi). 50/60 can become 5/6 or (Mi^b). 60/60 becomes 1/1 or (Do), an octave difference.

Why this procedure should follow the exact same sequence as our music analogies perhaps requires a looking into the basic structure of our mathematical system. The question comes up, is it the system of mathematics or is it perhaps some more basic universal laws that we are encountering here?

The sequence in the illustration is different from the sequence here because of some miscalculations. While it is not valid in specifics, the basic idea could be explored further, therefore I have kept it in, so as not to disrupt the sequence of lines of thought involved in the whole process of this work. It is the principal, not the details (which are subject to error) which are most important in understanding this effort.

INVOLUTION EVOLUTION AXIS -ORBIT OF MUSICAL DIVISIONS. (RE: ILLUSTRATION # P-18).

An eight by eight grid was set up. A diagonal line was drawn, so that the line did not fall on any of the dots, or small spheres. We called it the evolution axis because the line went from the corner of the perimeter to the other side, marked SPACE FOLD. In other words it traveled away from our point of reference. It did not become an evolution motion UNTIL IT HAD PASSED HALF WAY THROUGH a section of the CIRCLE.

At right angles to this evolution motion we drew a diagonal and called it the involution axis, since it proceeded inward to the center of the circle. At the point where the involution axis meets the evolution axis, INVOLUTION BECOMES EVOLUTION. It is at this exact orbit that the note (Sol) representing Earth moves. We can picture space moving in sine curves around each orbit, with the planet notes becoming the nodes, the place on the vibrating space string where the concave becomes convex, and motion ceases to exist.

The orbits of these two rings of circles mesh. There is a blow up of this in the next illustration, with all of its implications hinted. The circles mesh because we took as the center point the first sphere on a diagonal along the involution axis. This center point can be considered a sun, or Venus (Do) point. We took as a radius the two points lying close to the diagonal of the evolution axis (Sol). We then took twice the radius for the perimeter of the circle or (Do). We then proceeded to halve each orbit. This is explained more fully later. By halving each orbit, first going in toward the center, then halving by going towards the rim, we obtain two different patterns, one expressing the contracting energy (bottom) the other expressing expanding energy (top). This fits in with our finite, consisting of a descending scale, and the infinite, the ascending. The infinite orbits are on the space side. The finite orbits are on the time side. Time contracts. Space expands. What we find when we contract by halving inward is that the notes are the first (Sol), then (Fa), then (Mi), then (Mi^b) which dissolves into the core, on the time side. On the space side, we have first (La). banded by (Ti) on the inside, (Re) on the outside.

The way we arrived at this was to count the proportional spaces on the half of the circle which we did not use in the beginning, the half which we left

open when dividing by half in an inward motion towards the center. If we should examine the grid in illustration 13 we shall see this open space to the right on the lower side. If we now divide the full length of the radius from the center to the rim into eight sections (the sections are diminishing and unequal in the center area because of the progressive dividing by halves whereas there are equal sections in the rim because of the dividing by halves first on the one and then on the other), we can determine all the ratios needed. By counting three from the perimeter, we have five out of eight or 5/8 (Ti). To obtain (Re) 7/8 or seven out of eight, we count seven from the center. Counting five from the center gives us (La) 5/8. The pattern of all these rings are remarkably satisfying and symmetrical and balanced visually. We find that in constructing the orbits in sequence, that there is a sucking inward motion first, where speed apparently increases, length shortens, matter disappears, then perhaps blossoms from an implosion to an explosion, where it might curl up in petal-like forms on the rim in four layers, first the center, then inward, then outwards, with the outer rim being the all inclusive (Do), 1/1.

It is very important to mention here that if we set up all the degrees within a circle (according to the number of sides of a polygon) (See illustration 38), and if we stretched the angles out on a string marked with the degrees in their appropriate places, we would have the EXACT SAME MOVEMENT, SEQUENCE, AND VISUAL FORM as these orbits. As we mentioned before, the two orbits were juxtaposed for clarity, and even more importantly, to show how orbits meeting in this way have many different properties, as we would discover if we followed single lines from one circle to the next in wave-like lines. As we pointed out earlier, one line at any point on a series of circles either

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expands together, or contracts together. That is the line runs either along the outside rim, or towards the center part of each circle, and they do this alternately, much as we would expect from wheels going in opposite directions next to one another in a series of gears.

The conjunction of two rings, where one would be going in one direction, the other in the opposite, we put as the beginning of life, as motion must slow at that point where matter is formed. This concept leads directly to illustration #19.

BIRTH OF A MUSIC GALAXY. (RE: ILLUSTRATION # P-19).

Here again we come to our germinal core, where many of our intersecting circles meet. The shape of the core is in reality a whole circle with the middle folded inward. So we may imagine a fold in space running through the length of this form. If we use the principals we just discovered of halving, we find that the line or fold when divided in half yields the exact measurement of a radius of a whole circle. This assumes enormous implications if we remember that the radius of a circle divides the circumference into six equal parts, forming a hexagonal shape, an I Ching manifestation of one becoming six. The 60 degree angle has relevance because it is the angle of the sides of the hexagons, or six triangles. In other words, the halfway point becomes the CENTER FOR ANOTHER CIRCLE. We also find an involution to an evolution sequence, where the entire radii of one side, in essence, becomes the motionless zone, a whole note, a (Do). The other side is divided into halves representing 2/3, 4/3, 4/5, and 5/6 time wise, a half note, quarter note, eight note, and sixteenth note, where it moves at a

faster and faster pulse until it intersects with another circle, where the motion in the opposite direction halts where at the halfway point it again becomes a radius to another circle. Where these two centers find themselves in opposition, another core of a diminished size is formed. In this case it is the whole core that is the concave radius of the whole series. The size of the radius has differing center points, the first at the center point of the opposite circle, the other at the conjunction of the circumferences. The center notes were determined by utilizing the idea of double fifths which make up an ascending scale of (C), (D), (E), ($F^{#}$, G^{b}), (A^{b} , $G^{#}$), (B^{b} , $A^{#}$), (C^{b} , $B^{#}$).

If the ascending scale is an approximation of double fifths, this establishes another rule, of doubling, the measuring rod being the same, that of fifths. Double fifths give an impression of a contracted octave. The B" being closely related to (C), was placed at the half way point on each circle. The notes would descend on the other side. We again would have little trouble in imagining a larger fold down the center of the smaller core. The angle remains the same. There is simply an increase of fold.

ORBITS OF MUSICAL DIVISIONS (PULLED APART ON A FIELD OF NINE). (RE: ILLUSTRATION # P-20).

This diagram is almost identical to the orbits described for illustration eighteen. The differences are that the entire field of nine notes or points represent numerically (Fa) 81, rather than (La) of eight points (64). Forty five dots on one side of the diagonal symbolizes (Re") 45. Thirty six on the other side stands for (Sol) 36. (La) at 60 overlaps some of (Sol), and all of the (Re"). A traditional music staff was drawn, and notes placed along the orbit, in the order they fall, (Do), (Re), (La), (Ti), (Sol), (Fa), (Mi), (Mi^b) and (Do). The entire diagram should be considered as a MOVING DIAGRAM, THE RINGS PULLING OUT IN NEGATIVE TENSION, PUSHING IN, INTERSECTING, REVOLVING AROUND EACH OTHER, WHEN TOUCHING GOING IN OPPOSITE DIRECTIONS, ONE IN CENTRIFUGAL MOTION, THE OTHER IN CENTRIPETAL MOTION, MACROCOSMOS, MICROCOSMOS, OUT, IN.

From our vantage point between the microcosmos and the macrocosmos, time seems speeded up in the microscope, slowed in the telescope. Does a magnification of large areas in a large scale decrease speed? Is time acceleration and deceleration? Is time merely speed? These are the sorts of questions we ask when we think of motion.

CORES OVERLAPPING. (RE: ILLUSTRATION # P-21).

If we can imagine this drawing to be a close up of what might happen when the cores of the musical orbits meet, it shows a possible reason for the layers of different dimensions resulting in a STOP, A REVERSAL, A GOING IN A DIFFERENT DIRECTION AT THE (Mi^b). Since this grid is made up of only eight points along the ladder of sounds, and if we imagine waves spreading simultaneously from point 1/1 and from point 8/8, they could meet at 4/4, (THE MIDWAY POINT). It could be at this point that the shock of stoppage could generate a change of scale, a regeneration, NODES, OR PLANETS, VISIBLE WORLDS. The proof for this is offered in the following illustration.

IMPLOSION BECOMES EXPLOSION. (RE: ILLUSTRATION # P-22).

"When circles overlap... the forces seem to reverse and the cycle begins again ... "

This image might indicate how a core can be conceived as the contraction leading to an explosion, whereas the outer circles surrounding a square projection of a square would led us to think of the expanding forces leading inward to an implosion.(Drawing to the right of spheres diagram). The curved square-like form might lead us to consider a square form as symbolizing a contracting force, as opposed to the core form symbolizing expansion. If in the square extensions (drawing to left)²⁴ we say that the limit of one is TIME, THEN ONE SYMBOLIZES TIME, THREE SYMBOLIZES SPACE (three dimensions of space as opposed to one dimension of time). FOUR SYMBOLIZES THE VISIBLE WORLD, which is counted at right angles to time and space. FIVE IS MAN,²⁵ forming an imperfect square, but on both sides of the perfect square SEVEN SYMBOLIZES PERFECTION. NINE SQUARES REPRESENTS THE MOON, which comes at the junction of the two ends of the core. THIRTEEN REPRESENTS IMMORTALITY, the limit of the extension of the square. IT IS THIS DIAGRAM WHICH IS THE KEY TO THE NUMEROLOGY USED IN THIS WORK. (Also see Music Graphs Solo Orchestra).

LOOP.... (RE: ILLUSTRATION # P-23).

This may appear at first glance to be merely a blow up of the previous illustration, but there is an important difference. THE GRID WAS SET UP DIAGONALLY WITHIN THE SQUARE, SO THAT EACH CORNER

PROGRESSED BY ONE, THEN THREE, THEN FIVE, THEN SEVEN. SEVEN SQUARES FORM A PERFECT SQUARE WITHIN THE LARGER SQUARE FRAMEWORK. Because of this we are able to find a proportional difference between square one (the overall) and its tilted smaller one within it. At the same time we have a pattern very similar in triangular form to our original seed pattern of notes, this triangular form is, of course, a right angle, rather than a sixty degree angle.

Within the circular form bounded by the smaller square, the arrows represent a direction of motion, of different orbits which form expanding or contracting spirals, as each either goes towards the center or away from the center. The bar represents the point at which the arrows must shift either to the right or to the left. Musically, the line would look like the score to the right, when following the outer rim of the larger square (See darkest arrows). DIRECTION BECOMES VALID WITH A SPIRAL AS THE NOTES CAN BE ARRANGED ON THIS FRAMEWORK USING THE ANCIENT CHINESE DIRECTION NOTE CORRESPONDENCE.

This center portion could also explain why (Mi^b) **REVERSES MOTION, AND HOW THE POSITIVE** CURVE BECOMES A NEGATIVE CURVE.

CONTRACTING SPIRAL. (RE: ILLUSTRATION # P-24).

In this diagram we took the framework of the spirals in two different forms and imposed our note system on them.²⁶ We coupled this with direction. We have also combined our system of numerology on the left. The diagram at the left shows how by starting with a rectangle,²⁷ (Rectangle d'or), with the first unit the

equivalent of two squares, we can use the first unit as a smaller section of the following, the next whole the smaller section of the next, etc. The notes were laid out on this pattern conforming to the SEQUENCE OF THE GRID. The other spiral was used much the same way, one ring symbolized (Do), two rings (Sol), three rings (Fa), four rings (Mi), Five rings (La), Six rings (Mi^b). The following notes became (La^b), (Ti^b), (Re), (Re^b), (Ti), (Do), (Re), as the end of the cycle is a very dubious note, because the ratio of the vibrations to the original (Do) show it to fall in an area of three notes, (Ti), (Do), and (Re). By this time the spiral has completed itself as it comes back to its original direction, and lateral point in space, but so close to the center orbit that it could dissolve into it, at a dimension guite beyond our visual perception. We will note that there are seven larger rings, and that the fifth sequence is (Mi^b). The notes which visually seem to be on a greater scale are further apart, for example. The next six notes are clustered together in a much smaller area, at least half the length of the first five notes. There is some similarity to the planets here, as one can picture the planets closest to the sun, Mercury, Venus, Earth and mars, as orbiting around the smaller closer rings, while Jupiter, Saturn, Uranus, Neptune and Pluto are those further out.

If one applies a numerology to the rings, it is rather interesting to see the consequences:

- 1. Venus or ----- (Do) would be being and time.
- 2. Earth or -----(Sol) would be implosion, explosion.
- 3. Mercury or -- (Fa) would be space time.
- 4. Jupiter or ---- (Mi) would be the physical plane or number of objects.
- 5. Asteroids or (La) would be man

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6. Mars or ----- (Re) would be the soul.

CHANGING DIRECTIONS. (RE: ILLUSTRATION # P-25).

The directions of plant growth as indicated to the left resembles very much the direction of movement of the Mayan Katon Wheel, as the direction of the plant growth is counterbalanced by criss crossing diagonally movements back and forth in an ascending spiral.28 That is the reason the bottom leaf is (Do). The fact that the growth is in an octave enables us to place our sequence of notes, on each leaf, and in the process we have a spiral movement on a vertical rather than a horizontal plane. This fits some of Ouspensky's theories of the sun spiraling within the galaxy, and we can think of the plant's growth as a miniature galaxy. The sets indicate how the directions were determined. Since we used the progression from the grid, in order to fit the Chinese order of the notes into this, we had to set up four different systems, much as the I Ching is thought of as moving Hexagrams. Therefore, we picked from the four sets the notes which complied with the Chinese order. If we substitute North, South, East and West for the bars and broken bars of the I Ching trigrams, we see how this works.

PATTERNS OF MULTIPLES OF 2, 3, 5, 7. (RE: ILLUSTRATION # P-26).

Since we know the ratios of the notes to (C), we might take numbers which are found in those fractions, and use them to determine the slant of certain multiples of the numbers. For instance, 2 would equal (C), because 1:2 is (C), and 3:4 (2×2) is (F). The combination of the dotted slanting lines with the more heavily drawn slanted lines (D) and (G) bear a striking resemblance to the dotted lines extending from the point of the squares in the progression by squares (Illustration 46).

While the placement of the notes is inaccurate in this diagram, since it was one of the first, and the notes had not been narrowed down to those found on the universal ladder of sounds compiled by Alain Danielou, nevertheless, the principals behind the patterns can be applied, if the scale is proportionately the same. The scale of the galactic patterns can be enclosed in a square, and can become that of an octave, as can be plainly seen. The numbers 38 to 45 comprise eight steps. The notes falling within the circumference of the circle represent an octave, a (Do) to (Do), because the second (Do) is found at the 15/16 point of the diagram. The idea of the big dipper analogy is purely a visual one, but one which does appear to bear a remarkable resemblance to the big or little dipper. Where the planets fall at each note, its symbolic planet orbit was drawn. The idea of the space being folded was applied to this pattern, the folding representing either a folding inward (implosion) or a folding outward (explosion). The right section down represents the shape each note joined with its counterpart would take. (Fa) forms a cone, or perhaps more literally a trapezoid, as (Do), (La), and (Ti), (our symbol for the universal ladder of sounds).

More importantly, (La) also forms a zig zag, our symbol for TIME. 45 degrees show the apparent angle of (Fa) drawn from the widest mark within the octave (Ti) to (Ti) (9/15-15/9) to (32/45-45/32). Since there are twelve tones found within the octave, and the number of the notes found along one side of the diagonal are twelve, this might be an indication of the logic of these theories. The notes might move inward from the large (Ti) point at 9/15 and then outward from that point in the opposite. This was the same point, we remember, that we constructed another circle to represent the orbits of the physically impossible UNDERTONE SERIES with its notes all falling on the eights. This was also imagined as one of the unknown holes in space, where (Ti) or Saturn represents a contracting force. The reasons this section was labeled trace paths were because of the similarities of sound and its nature with electrons.

Of the two octave patterns, and triad patterns, the latter seems to hold the most interest as being similar to the pointed zig zag shape, in the progression by squares, trapezoids, etc. The points in any of these cases could indicate the place where one would hold a vibrating string to eliminate some of the harmonics. (A 1/7 eliminating the seventh harmonic, for example).

We have already noted that one of the puzzling aspects of music is the middle (C). When we count up from the middle (C) we come to (G) after FIVE STEPS, however, when we count down five steps we come to (F). The ascending measurement seems to have been based on a different numbering system, than the descending measurement.

If ascending is expansion, while descending is contraction, and one is time, the other space, one is forward, one is backward, could we not say that space and time are joined like the fingers of two hands. In time we can only go forward, in space we can move in any direction, but preferably in the direction OPPOSITE FROM THE DIRECTION OF TIME. It is this imbalance of space and time which makes the inversion notes zig zag.

The notes are not optical mirror images in these

EYES + EARS = IDEAS

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inversions but are counting first up and then down in narrowing zig zags until we reach the zero point of middle (C).

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PART 2

GLIMPSES OF BRIDGES OF ART

The preceding discoveries might appear to be very inconclusive. They should, because we are, at this point, in a situation of having amassed much data, and have it laid out before us, as if we were primordial creatures, recreating a civilization. It is a step by step process, a detective story, of a sort, where writer and reader are both struggling to fit together the bits and pieces of insights and growing awareness of the significance of being.

We should think of the part of this study as being the time in history when all the sciences, arts, religions, musics, magic, were one, before they were separated into their respective roles, codes, information, symbols and particular languages of form. It is when we lay it all out that we can begin to sort and speculate as to its meaning, its usefulness, its credibility. The language is strange, the symbols are unfamiliar, the thought process does not fall under traditional logic, because there is no tradition to follow. It is a gathering of small pieces of apparently unrelated unknowns to try to make sense of the physical and metaphysical world. It is putting imagination and fantasy in the provinces usually dominated by fact and practicality, to try to see what kind of a world we would perceive around us. In essence, then, we are substituting imagination for reason. We might call this an age of imagination. It is an example of the primitive mind of mankind striving to understand, and musing about existence. Or, it might be an artist's or poet's or composer's thoughts while in the process of creating. In any case, its a focusing on the UNKNOWN RATHER THAN THE KNOWN, so that it has little to hamper it's style,

has nothing with which to compare its fantasies, and nothing of what has been learned before to cramp its thoughts.

We might wonder, at this point, why a search for universal values has not germinated or yielded much fruit in the human race? Why the emotional side of nature was cramped, and the rational side extolled? Why the mystical side was shunned and the pragmatic lauded? We will, then, try to turn the pages back in the history of time and by accentuating those facets of imagination, feeling and looking at the world as a new born spirit, we shall attempt to reconstruct everything it has perceived with almost all of it's senses. And progress we will, perhaps, develop a heretofore unknown, unnamed sense, which might be closer to what is known as ABSTRACT REASONING. But this is abstract reasoning with a difference, A VISUAL DIMENSION. It is perhaps mystical in the sense that it is trying to make the SEEN HEARD and the HEARD SEEN, and we might be surprised at the results.

So far, this whole study has tried to take NUMBER and play with it, to discover what it means, not in terms of numbers of objects exclusively, but NUMBER OF VIBRATIONS WITHIN A GIVEN LENGTH. THIS SAME NUMBER BECOMES A PROPORTION NOT ONLY ON THE SCALE OF SPACE, BUT ON THE SCALE OF TIME.

It is a deceptively simple tool to use numbers representing both space and time. We are trying to take on the perhaps impossible task of trying to coordinate SPACE, THE VISUAL, DISTANCE, SHAPE, PLACE, SIZE WITH TIME, THE PULSE, SEQUENCE, VIBRATION, MOTION, DIRECTION, CHANGE, CYCLE. We find that we can make analogies substituting the abstract concepts of space and time to angle, form, shape, color, etc. It is these analogies which enable us to shift more easily from one dimension to another. This whole work might be considered an exercise in analogies, both visual and abstract. The purpose for these analogies is to extend our perceptions, and consciousness to other dimensions. We are giving in detail a process that might lead to this. We are followers of our inner nature, our intuition, which we believe is stronger than learned knowledge for this purpose.

This section implies concepts of perception. The idea behind this being one which suggests that the worlds WHICH we hear, touch and see are merely the response of our own organs to themselves. Is the universe not light years from us, but within us? Do we have our faces pressed up to the universe, and don't even known it? Could all of our knowledge come from elaborate conjectures built up in closed systems? Why are our mathematical systems based on symmetry of inertia, one side of an equation balancing the other at zero.

It may be dangerous treading on the toes of established theories, but the human being at some point must become as an Adam of Humanity, to get back to the essentials. There will always be criticism of those who threaten the system of others. Ideas are still the most dangerous instruments of all, in terms of influencing others. Yet, to be in a system, to have grown out of any system, pregnant thoughts about the unknown might have been crushed in the beginning. It might be being without blinders, one can see the most. Any system of study creates its own blinders of language or code, as an ancient secret society, to keep all other except the initiate out. The non-expert being is searching too, without specialized tools. The average human being has much to say and think. If all ideas were presented to include this ubiquitous being, "the average" person, all sorts of barriers might break down and esoteric knowledge might no longer be hidden. Perhaps the arts are the best way of presenting such things to the people. The arts which deal with symbols, emotions, esthetic pleasures, which all can react to.

This thesis, the aim of this study is TO CREATE ANOTHER ALPHABET OF VISUAL SYMBOLS WHICH RELATE TO THE FRAGMENTS OF KNOWN BITS ABOUT MANY SUBJECTS, SO THAT ALL MAY PARTICIPATE IN THE DISCOVERIES OF MANY FIELDS. ALL THESE FIELDS USE DIAGRAMS TO TRANSLATE AND RECREATE THESE DIAGRAMS THREE DIMENSIONALLY SO THAT WHEN A CERTAIN SHAPE, OR COLOR, OR SPACE, OR INTERVAL, OR ASCENDING, OR DESCENDING, OR ANGLE, OR NUMBER, OR FOLD, OR FRAMEWORK IS USED, THEY ALL HAVE A COMMON MEANING WHICH CAN SERVE TO ADD ANOTHER PIECE TO THE PUZZLE OF OUR UNIVERSE, OURSELVES, OUR **RESPONSES, OUR NATURE, PHYSICAL, MENTAL** AND EMOTIONAL.

And so that this set of postulates doesn't fall into the trap of other disciplines, it is not intended to be a definitive, absolute. No one should try to put the blinders of these ideas on permanently, but should put as many blinders on as possible, and then take them off, to put others on. The point is to be constantly curious, and inquiring about everything known that no one thing holds the answers. It is the questions which are always of the same nature. It is the questioning spirit, the search of impossible absolutes, which give meaning to our otherwise dull life. If we try to focus our entire being on some one thing, it is true that it becomes an obsession. But we can try to aim the telescope or microscope of our lives so that it is pointed at whatever gnawing we feel, in order to understand ourselves and our place in space and time.

So this is aimed, at the poor, the weak, the old, the deaf, the blind, the lame, the physically, mentally, emotionally crippled, the young, the rich, whose wealth does not satisfy, the unlearned, the untaught, and the learned who wish to fantasize and be reminded of things they once learned and forgot, the doers, to whom the doing does not satisfy. It is aimed at those who like to lie on their backs and look up at the clouds or stars, and wonder what it is all about. It is for those who search in the dim collective memory of the past for the lost Garden of Eden of Mankind.

THOUGHTS WHILE WORKING

DIVISION OF STRING ON RIGHT ANGLES. (RE. ILLUSTRATION P-33).

We can determine the relative lengths of proportions of a string, very quickly and easily by this method. The proportions are determined by the numerical ratios of the notes in music. By setting up two axii at right angles to one another, and then counting off 1/2, 2/3 etc. , we not only have a picture of the different lengths, but also the spacing between each interval. Visually the result of this resembles a fold, as if two areas receded towards the middle. The diagonal 15/16 (Do) divides our square almost in two parts. This is very reminiscent of the diagonal drawn to one side of a square so as not to connect points (TIME SIDE,

SPACE SIDE Since the diagonal IS THE HARMONIC DIAGONAL OF THE GRID, ANY POINT ON IT IS TAKEN AS A WHOLE 1/1, 2/2, 3/3, etc. It also follows the same sequence as the vibrations of the harmonics on a grid, however the pattern of notes does have a different spacing in this case. We are dealing with wavelength, which is the reciprocal of frequency in order to portray musical ideas visually. (Mi) in frequency would have the ratio 5/4, 6/5. The two (Mi's) (4/5, 5/6) appear to disappear into the center of the bar. If we can remember that the entire ladder of sounds, within an octave lies along the diagonal, we can imagine the 15/16 line being this ladder, enclosing 52 notes at increasingly high ratios. If we can also imagine folding any square over at the one half mark, and then proceeding to fold at the next half, etc., we will have accordion-like folds of differing depths, the most shallow being at the (Mi) area. The top web-like pattern shows how different the structure looks when the axis are reversed in number. We obtain a whole new concept of depth. We have already thought of this webbed structure as simulating time, as it seems to equate distance with sequence, and interval.

Space as symbolized by the lines of length, distance from one another, balance time on the other side using exactly the same for, a 1 to 15 structure in an inversion. The space side is less than a whole, the time side is more than a whole. Each letter should be given as multiples of 2/3 according to the CIRCLE OF FIFTHS formula, where one side of a triangle is doubled and the hypotenuse is tripled (harmonic-diagonal).

EYE... (CIRCLE) EXPANSION. EAR... (SPIRAL) CONTRACTION. (RE. ILLUSTRATION P-34).

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If we take just the physical appearance of the eye and the ear, we can attempt to draw conclusions about expanding versus contracting, inner versus out, the circular form of the orbits versus the thee dimensional spiral. We speculated previously about a descending scale representing a contracting. We also speculated about time contracting to space. We have also discussed implosion and explosion. Here, at the heading TIME CONTRACTS TO SPACE, is an imploding from the top of the cone, changing direction, at the implosion point, where matter becomes most dense, and smaller, and finally explodes on the other side of becoming the base cone.

We speculate from the present astronomy that the new blue stars are the rim of former galaxies. If we say that the (C) or (Do) is the newest star, we progress in terms of our music theory sequence to our familiar pattern, and complete an octave, we would find our own universe to be the lower half of the cone, where we would be progressing in a descending motion. However, in order to maintain a continuity in motion we must MAKE A LOOP TO CONTINUE IN THE SAME ORDER. At the point where implosion becomes explosion, the image might look like the body on the left. (SPACE EXTENDS TO TIME.) The eye, then, in shape alone resembles the expanded point of space, a perfect measuring rod for space? The ear, in shape alone, resembles the contracting point of space, a perfect measuring rod for time? The ear, unlike the eye, multiplies one sound into harmonics which do not actually exist.¹

It is here that we wonder if the UNIVERSAL LADDER OF SOUNDS IS NOTHING MORE THAN THE MULTIPLIED VIBRATIONS OF THE EAR? The membrane of the ear also seems to shorten wave lengths which are coming from outside, in what might be considered a macrocosmos to the ear, and transforms these to a microcosmos signaling the brain. If in the study of music, we try to REDUCE EACH OCTAVE TO ITS PARTICULAR SCALE, we are doing what nature is doing, GIVING EACH SCALE THE ABILITY TO MEASURE ITSELF WITHIN ITS OWN FIELD. If man measures the sound environment around him by reducing large wave lengths of sound to short vibrations, does the solar system measure itself with its planets, and perhaps its asteroid membrane? The galaxies measure themselves by what?

If we think of the highest pitch in hearing vibrating at 40, 000 vibrations per second, and the highest pitch has its waves within an inch of space, and that the lowest pitch in hearing has 20 vibrations per second, which are found within a space of 50 feet, ² it would take us approximately six steps to reach even fifty inches, based on previous construction of modules, and many more to reach fifty feet, unless we reduce each step to encompass a larger field. This is exactly what we find we must do.

We are very lucky to have an octave to work with. For as long as we encompass approximately a whole octave into each reduction, we have a very good measuring rod, which takes into account the multiple of vibrations very much as electrons have always a multiple as a unit.

This is not the place to go into detail the complexities of this reduction of scale, but it is important to that in the process of reduction of scale we go from a microcosmos-like scale of implosion, to a macrocosmos-like scale of explosion. This makes us think that the outside world of the sounds implodes into our senses, and explodes into our consciousness.

AREA OF HEARING - DISTANCE COVERED BY A FALLING OBJECT. (RE. ILLUSTRATION P-35).

Specifically, the diagram here presented is a rough attempt to link mathematics with a sense, that of hearing, and an idea of the emotional response of linking number with a word symbol, which conjures up a host of image, and mental tones together. At first glance this may seem superficial. The diagrams were taken directly from another source, with the notes superimposed over this framework. ³ The reason this diagram was chosen is that the shape of the area of hearing was quite fascinating, very similar to our familiar half circle, whereas the square progression of the falling object was also familiar, so that obvious analogies were found.

The idea of TIME AND DISTANCE CO-EXISTING, SEEMS TO RELATE TIME AND SPACE. The formula y=16 x² also coincides with the end of the first cycle, (15/16). It isn't as though these images and thoughts are definitive in themselves, but that they lead to other ideas, which in turn engendered others. It is this mind stretching type of reasoning which is important, not a conclusive statement. From the previous pages we are aware of the origins of the number symbols. They, too, could have been different. The one's we finally chose have been used consistently throughout. It is the consistency of a few numbers which gives this work its framework. It is because we have decided to use a few unchanging numbers, that we can spread over so many subjects. We simply want to see what will happen if we apply these numbers to anything we can think of. To our knowledge, this is not usually done, in mathematics. That is why we like to think of it as a

new form of reasoning where we have specific numbers, we just have to fit everything else into their pattern.

The numbers were chosen for two reasons. One, they were the ratios of intervals known in music in Pythagoras' time up to the present day. Two, they were chosen because of the ease with which they could be applied to intuitive flashes of what might best fit the numbers. In intuition something inside says, yes! That something inside is sometimes called innate knowledge, a knowledge which is barely recognized today as significant, but which exists in all of us, so that when we are presented with an idea or image, or sound, an affirmation nods yes within us. If we should take these concepts of essentially single words, and analyze them as applying to our innate knowledge, let us see what we might discover. Time appears to be equated with being. Time is movement, traveling a distance. In our bodies all is movement. Being is movement. Thus time is being. Space is distance. In space objects are either attracted to one another in a type of gravity, implosion, or repelled in a type of antigravity, explosion. Thus space describes the area of explosion or implosion. Space taken on a larger scale denotes an enveloping, of other space, our bodies enclose their space, the world encloses its space, the solar system encloses its space, the galaxy encloses its space, and the universe encloses its space. To some the universe is God. To some the universe is made up of natural forces. Thus, space can be both God and nature. The visible world is a world of objects we can see, feel, touch. The invisible world is a world of perceptions emanating from an object, smelling, hearing. Organisms seem to be the receptors for these objects and emanations. The earth is an organic whole. Between the human and the visible world is the

invisible world of longing for perfection. Perhaps the pattern of growth to this perfection is by means of an <u>octave</u> development. We have already established that the octave deals with eight directions, N, S, E, W, NE, SW, NW, SW, eight tones, (or twelve, or fifty two), eight steps, seven vibrations, the entire color spectrum of the three primaries, blue, red, yellow, black and white, and the secondary colors of orange, lavender and green. The octave deals with sequence, and with cycles, with time and space. The octave deals with whole numbers and fractions, with shapes, ascending and descending motions, and with reductions and expansions.

The <u>moon</u> creates the tides, growth of trees and plants, a generator to the earth. Within the hollow of the moon would be a <u>reverse perspective. (Mi)</u>. The moon would be the rim of the universe to whatever is inside. A <u>new cycle</u> is a half of a circle, with <u>life</u> on one side, <u>death</u> on the other side, one half of a wave imploding on one side, exploding on the other side, and reversing as it travels from one half circle to the next in vibrations of the <u>earth</u> in <u>time</u>. Beyond the skin of any object is IMMORTALITY, AND THE ABILITY TO CHOOSE THE POSITIVE OR THE NEGATIVE, OR GOOD OR EVIL.

MOBIUS STRIP.⁴ (RE. ILLUSTRATION P-36).

This then brings us to the problem of inside, outside. As we know, the only way to go from inside to outside without actually turning over a piece of paper is by way of the half twist of the Mobius strip. A music score inscribed on one side of a strip of paper, shows what happens when the whole is twisted and flattened out. It FORMS A TRIANGLE. When it is cut down the middle and pressed flat again it FORMS A SQUARE.

ONE HALF OF THE SQUARE CUT ALONG THE DIAGONAL REPRESENTS THE INSIDE, THE OTHER HALF REPRESENTS THE OUTSIDE. This is extremely important as it recalls our grid and one half of the square becomes space, the other side becoming time. What might be significant is that the diagonal might be the place where we could begin our angles. The diagonal represents 180 degrees. All the other angles could be determined on the outside section of the strip (one half of the diagonal.) To go even further, cutting again through the middle of the strip, we find we have two pieces, linked. One can be pressed flat to form a rectilinear shape, with the staff running the whole length of the shorter side (outside) and the other (inside) running the entire length of the other side. On one half of the other two sides, each outside is directly over its counterpart. The other loop can also be formed into a square by flattening out four corners, and again we have one half separated by a diagonal forming outside and inside, space and time. It is the metaphysical significance of this operation which we wish to convey. It illustrates the apparent incommensurability of space and time. It indicates that what separates space from time is THE FOLD. It reveals that what is inside the fold is time, what is outside the fold is space. This procedure also shows us the importance of angle. In the first instance the three sides form 60 degree angles to form an equilateral triangle. In the second case, the four sides form angles of 90 degrees in a perfect square.

In the third cutting of the Mobius strip, the eight sides form two interlocking rectangles. The fact that a physical manipulation of one unit, so to speak, can yield so many different shapes, so easily, gives us much to think about, especially if we remember that it is the FLATTENING OF THE LOOPS OUT INTO

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POLYGONS WHICH WE CAN ANALYZE. We have previously discussed the angle of the radius as indicating the degree of motion. In the ninety degree angle, we remember the motion is stopped, whereas in the sixty degree angle the motion has the greatest acceleration.

The musical ratio axis developed by Alain Danielou⁵ was drawn to show how the multiples of notes on different axii could conceivably fit into the Mobius strip. His patterns of triangular shapes which suggest folds in space could apply. They all fit into a basically square shape. This is only one analogy, the imagination could supply many more.

The I Ching Hexagrams are pictured here to indicate the possible analogies to the concept of inside, outside, or opposites such as the creative and the receptive powers of change of the Hexagrams. 6 The chart also shows exactly how the placement of the notes was arrived at. The whole number or its equivalent (a multiplying number) was placed at the square of that number in a spherical form, and given its appropriate color from our music color analogy. The pattern becomes a fixed pattern visually. But if we imagine EACH SPHERE TO BE ON AN ORBIT WITH THE CENTER, THE CENTER OF THE CHART, WE HAVE THE EXACT SAME PROGRESSION ARRIVED AT BY HALVING THE CIRCLE FIRST TOWARD THE CENTER FOUR STEPS, THEN BACK TOWARD THE RIM OSCILLATING. It becomes a moving diagram close to Ouspensky's via Gurdjieff's ideas.⁷

If we wish, we can give each note its corresponding Hexagram (a combination of the horizontal and vertical trigrams) and by its number determine chapters of images, dealing with psychology, philosophy, change, attitude, a bible of thoughts.

The images of light, well, increase, small, thunder, lake, fire, wind, wood, eye, ear, hand, mouth, foot, thighs, belly, the images of merely eight notes of an octave give free rein to our imaginations, where we can wander in even greater expanding realms of thought.

To get back to Danielou's diagram, the inside core, is simply a detail we worked out to show what could be happening at the center of his. Ours included points one through six. This is applying our theory of six steps or points of activity to complete a cycle. A cycle implies movement and change, so we are not too far removed from the I Ching book of changes.

The drawing of the element #45 happens to be the number for (Re[#]) or (Mi^b) in our system. (Re[#]) or (Mi^b) is the core which disappears into another dimension, as if an energy pulled it to the inside with such force that it missed its point of inertia and went on to swing back and forth at the outer rim of the circle. (Mi^b) or (Re[#]) is also the hexagon and the 60 degree angle, THE GREATEST FORCE. This also shows how we can apply the numbers of the notes to the periodic table of elements, and in so doing conjure up images based on what is known about these elements in terms of numbers alone. ⁸

SECTIONING OF CIRCLES. (RE. ILLUSTRATIONS P-38 & P-39).

Of all the ideas in this book, this one is perhaps the most important to us. It is important, because if the radius of space is considered to be a function of time, we might be close to solving the riddle of SPACE TIME. ⁹ the radius is integral to our thinking. The keyboard itself can be considered as diminishing and increasing radii, as each note is played.

An octave would be the limit of the increased radii, whereas (D), or (B) would be the diminished radii. The ascending could be considered positive, the descending negative. Just as the clock face of a watch has radial arms to count time, angles as determined by polygons are the radii of the circles around the polygons. A way to determine angle as a point of reference is to take a circle, and starting from (Do) or (C) with a ratio of 1:2, one half of the circle if 180 degrees. If we start then at 180 degrees and plot out our notes from this reference point, we will have notes representing three sides, 120 degrees, (G) (2/3), four sides, 90 degrees (F) (3/4), five sides 72 degrees, (E) (4/5), Six sides, 60 degrees (E^b) (5/6), etc. The limit is reached at twenty two sides, which brings us back to the full circle, and there is no need to go further.

The other thing which is extremely important is that if we take a string the length of a closed circle, and lay it out on a straight line and section it according to the same fractions, and then compare this to the degree marked on the string, the two coincide. What is remarkable about this is that the systems used were very different, angles forming polygons vs. a folding or sectioning of a string. But not only does the string correspond to the angle measurements, when the two are laid out together in a straight line, but it also corresponds to the diminishing orbits of a circle by halving toward the center, and then towards the rim. What we seem to have is a picture of a section, and a picture of an elevation, almost as an architectural version of a building, floor plan and view from the eye level. But this different because the height, as such

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does not exist here. But what exists is on a different dimension. We are using a new perception to recognize it. If the radii are a function of time, we might have a spatial and temporal picture, a co-joining of the organs of our ear and eye.

If we can imagine the circles with their inscribed polygons as patterns of the forces of life, and as the radius swings around the circle, the patterns change, ascending, descending scales are heard, accelerations take place, and we find ourselves in a cosmological universe of imagination.

<u>I CHING PRIMAL ARRANGEMENT</u>¹⁰. (RE. ILLUSTRATION P-40).

The next four illustrations show how we can apply a philosophical system to the scale of octaves. One of the reasons the I. Ching or Book of Change was chosen as a framework was that it is based on number (1 to 64). It also deals with beginnings of the world or universe in very visual, abstract and interchangeable symbols. The numbers represent steps on a scale, and a sequence of becoming. Starting with number six, they represent the elements of water, fire, wood, metal, and earth. According to this, the beginning was water, which turned to fire, which became wood, which transformed to metal and finally became earth. Musically, it is (A), (F), (D), (C), (E), (B), (E^b), (G), (A). We were able to arrive at this scale by translating whole numbers of multiples into the hexagram symbols, and then re-translate these back into a sequence of numbers up to ten. This whole idea represents the five stages of change, as it was in the beginning of time. We merely set up the numbers as objects joined by webs of lines, representing time.

PRIMAL AXIS - INNER WORLD AXIS¹¹. (RE. ILLUSTRATION P-41).

A square was divided into four equal sections. On each section equidistant dots were put. A diagonal was drawn through the space between the dots, and a TIME-SPACE dimension was formed. A circle was drawn with its center at the middle of the original square. . The notes were laid as objects around this circular orbit, as they would appear as objects instead of numbers, objects which symbolize musical notes, and represent what is known as the PRIMA AXIS in the I Ching. Within this circle were laid, as if on radii, the note spheres representing the INNER WORLD AXIS OF THE I CHING. These radii indicate the concept of time, as the outer circle represents the concept of space. If we fold diagonally across, along each of these axii, the whole takes on a spiral shape. The folds must change direction at the fourth step, which is (D") or (E^b). This we can not help but notice is the same place the direction changes in the Mayan Katon Wheel, a dividing of the orbits by halves, the dividing point of a string when we shift from one half of a string to the other half, the focal point of the TIME CONTRACTING TO SPACE. (Illustration P-34).

In the patterns of multiple of 2, 3, 5, 7, (E^b) is the angle of most acceleration (Illustration P-26 dotted line). It is the end of the first SPACE CYCLE of 9/8 on the grid (illustration P-13), the point at which space become time. It is the point of reverse in the CONTRACTING SPIRAL (Illustration P-24). It is the beginning and the end note of EXPLOSION BECOMES IMPLOSION (Illustration P-23), as well as being the tip, or limit, to the four corners of the square in that diagram. In illustration P-22 it is the balanced seven squared framework which holds the implosion within the square, the explosion on the outside of the square, where we can trace the forces seeming to reverse are close to the shaded square area. In illustration P-21 it is the area which appears to be a square bounded by triangles on two opposite ends (a significant shape of a hexagon, and one which matches nature's hexagonal shapes).

In illustration P-20 it is the middle section of a music staff set up on an orbital relationship of one note to another, where the notes were placed depending on where the orbit fell, and, of course, the orbits were hardly arbitrary, as we have seen. In illustration P-19 its the place at which we find THE BEGINNING OF LIFE, and the fastest musical pulse of the thirty second note. It is at the end point of the INVOLUTION AXIS of illustration P-18. It is the end of the mathematical cycle of the CIRCLE OF FIFTHS in illustration P-16. In illustration P-15 it becomes the boundary of the end of the TIME WHERE SPACE BEGINS. It is the area where the INNER EYE LOOKS INWARD TO THE INFINITE in illustration P-8. It is the approximate 60 degree angle on the chart of galaxies in illustration P-7. It is at the limit of the MACROCOSMOS illustration P-It is the spot at which the vibrations on a string are reversed in illustration P-5. It is the only note lying outside the triangular form in illustration P-3.

We are making these analogies illustration by illustration to show you how we could take any statement and trace it back on itself. Whether they would yield so much that is similar would have to be experimented with. The question raised, is why do so many things fit? Is it the way we have to set up the whole, so that it becomes only a function of our own reasoning? Or is it a universal phenomenon which leads us to greater truths?

I CHING - PRIMAL AXIS, INNER WORLD AXIS. (RE. ILLUSTRATION P-42).

This diagram merely shows how the preceding diagram was constructed in accordance with the Chinese symbols Chien, Sun, Kan, Kun, Chen, Li, and Tui. If we examine closely these bars and broken lines, we discover that they are direct opposites of one another not only in direction (at each end of a diagonal) but in subtler ways... three broken bars... opposite... three unbroken bars, etc. The fact that these are pictured as see saw type forces, balancing one another is an important facet to understanding he implications of this image. It is reasoning at a very abstract level.

If our reasoning processes could be so balanced a new astonishing world might open unknown vistas to our minds. In a sense, they are inversions. One order is called the PRIMAL ORDER, NOT THE ORDER AS WE KNOW IT NOW, BUT THE FIRST ORDER OF THE UNIVERSE. If we examine the second order, THE INNER WORLD AXIS, we find an even more asymmetrical balancing. for example, Chen is balanced by Sun, three bars... to bars, one broken. Kan and Li are the same in both systems, one bar in the middle, versus a broken bar in the middle. Ken is balanced by K'un, two broken bars, one bar, versus three broken bars. Chen is balanced by Tui, one bar, two broken, versus one broken two bars. When we translate these symbols back into another vocabulary of notes, we have in the PRIMAL ORDER (Fa), balancing (Re), (Mi^b) balancing (Mi), (La) balancing (Sol). (Ti is a mistake in the drawing!)

While the INNER WORLD AXIS we have musically (Fa) balancing (Mi^b), (La) balancing (Sol), (Ti) balancing (Re) (Mi) Balancing (Do).

Numerically, this becomes in the PRIMAL ORDER six balances two, four balance three, one balances nine, eight balances seven. While in the INNER WORLD AXIS, numerically, we have six balance four, one balances nine, eight balances two, three balances seven.

Could we not take an equation for universal phenomena in the visible world. The PRIMAL numbers, and for the equations of the organic or INNER WORLD the INNER WORLD AXIS NUMBERS?

An equation might be: $x(2^2 + 6) + y(1 + 3^2) = x 1(2^3 + 2) + y(3 + 7)$

x	=	 One Axis
y	=	 Another axis
x1	=	 Another Axis
x2	=	 Another Axis

If we actually construct objects for this equation, one square stands for a unit of one, two squares stands for a unit of two, etc. , the length increasing while every other dimension is held constant, applying the first order to these objects and arranging them in order, we have a very non-symmetrical form of varying lengths. However, if we apply the laws of the INNER WORLD AXIS to this, our objects maintain a perfectly balanced symmetry of four bars, each segment of which adds up to ten units. The shape then becomes either a square or a cross. Further, if we add our planet correspondence to both orders, we find that the earth (nine, (G)) and the asteroids (one, (A)) REMAIN CONSTANT in both operations.

There are four rows, then, of eight interchangeable pieces, the ratios being 4/6, 1/9, 2/8, 7/3. In Chinese mysticism the odd numbers symbolize heaven, the even numbers symbolize earth. If we say that earth means the material world then Mercury and Jupiter (four and six), and Saturn and Mars (eight and two) represent the material world, or musically (F), (E), (B), (D). Whereas, the asteroids and earth (one and nine), and Venus and Jupiter (seven and three), or musically, (A), (G), (C), (E^b), represent heaven, the invisible.

Are we, then, part of the invisible worlds? Are we then invisible, and to whom? Perhaps we are invisible to the creative forces of the universe, just as those forces are invisible to us. Musically, too (E^b) and (F) and (D)and (B) would be the material, yet these are considered to be the unstable note in music, the second and the seventh. It is the (A) (G), (C), (E^b) which signify heaven, which, with the exception of (A) and (E^b), are considered the stable notes. Are then, these the notes which we long for, to complete our existence? The (E) and (E^b) assume such a dichotomy, being both in the material and the immaterial world, a connector, so to speak, between the visible and the invisible.

Even the bars we have constructed are arranged in such a fashion as to create a material world surrounded by the immaterial, which is, in turn, surrounded by the material, a progression from the material... immaterial... material... immaterial. This, then, is the sequence.

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I CHING CHART. (RE. ILLUSTRATION P-43).

In order to see exactly how this was constructed, it is necessary to go back to illustration P-37 of the I Ching hexagrams. This diagram is simply an enlargement of the first, with the addition of orbits drawn to each note from a center point. When the resulting orbits are studied, it is perhaps not so surprising to find that they fit exactly into the same orbits we have been dividing by halves, sectioning angles, and a given length of string. This pattern also indicates where we might start, if we began rotating each note on its own orbit. To determine the rotation of each orbit, we might take the rotation of the rings of Saturn, or the rotation of the planets around the sun, or of electrons around a nucleus, etc. The fact that the notes do not correspond to the natural order of the planets around the Sun, we have already discussed. If the motion is in a zig zag as if there were folds in space, this order would then fit into the pattern.

Something which should be brought out here is if we analyze the steps necessary in determining the placement of the notes, we have fourteen steps. We can also see the balancing of the Chinese symbols at work. To analyze these here would take much extra time and work, but anyone could work this out and probably find a meshing of the PRIMAL ORDER AND THE INNER WORLD AXIS. The little idea at the left has much importance, as it might be an indication of how the numbers of the notes originated.

If we divide 360 degrees by five (which is MAN) we arrive at the figure 72 (Sol), we could either divide this in half to arrive at 36, or we could divide 360 by 10. 360 is, of course, the number of degrees in a circle. These degrees are not arrived at by simply sectioning a circle into quarters, eighths, sixteenths, thirty-seconds, sixty-fourths, one hundred and twenty eighths, two hundred and fifty six, and five hundred and twelve seconds. Why 360 was chosen is an unknown we cannot discover. ¹² Perhaps it was done to facilitate a quartering of a circle into 90, and 180 degrees, etc. which idea seems dependent on polygonal shapes. (See illustration P-38).

FIELD OF NOTES - INVOLUTION EVOLUTION AXIS. (RE. ILLUSTRATION P-44).

This illustrates the reasoning behind the construction of an axis with its numbers running in inverse directions. This is important because to fit into everything else with which we are dealing, we know that one axis goes inward, contracting, as it were, while one axis travels outward, expanding and increasing. In the very beginning of this study we noted that different ways of measuring yielded very different results. Here, we see that these different measuring rods, the finite and the infinite, fit together as right angles. Before, we did not realize this. Therefore, a whole is beginning to take form in our minds. If we, at the same time, combine the numbers with which we have been working up to this point, we will obtain slightly different configurations in terms of the shape of the curve. For instance, the number ten indicates completion. We can indeed plot notes (Do), (Sol), (Fa), (La), (Mi) on this web by simply joining the two numbers in a ratio. One is joined to two for (Do), three is joined to two for (Sol), four is joined to three for (Fa), four is joined to five for (Mi), five is joined to six for (Mi^b), three is joined to five for (La), and seven is joined to eight for (Re). This, we recall is the space dimension.

The time dimension folds over into the area which is unseen, invisible. When we apply the number seven to indicate perfection, the last one of the space dimension, and the number 11 to indicate a completion of a cycle, we see very visually how this can be possible. Fitting all of these together into a perfect whole is a task beyond the present capacities of our perception. However, we like to think that in the future this will be done as simply as adding or subtracting or dividing and multiplying are done now.

I CHING SECOND ORDER. (RE. ILLUSTRATION P-45).

This diagram was indeed an attempt to link the numbers of the I Ching together in a web. At the center of the diagram is a square made of four spheres with a sphere in the center, as five symbolizes MAN. Each of the symbols stand for earth, metal, water, wood and fire. Each has direction and season, and color, and NUMBER. (La) then, is North, water, winter and the number one and the color lavender. (Ti) is eight, Northeast and earth and the color black. (Mi) is three, East, yellow green, wood and spring. (Mi^b) is four, wood, yellow orange, Southeast. Nine is (Sol), South, blue, fire and summer. The Chinese color is different from the above. See illustrations 1 and 9. Seven is (Do) West. Metal, red. Six is (Fa), metal green, Northwest.

The factor which makes these numbers translatable into notes is the fact that notes can be changed for numbers. The numbers of the I Ching interchange so that nine becomes seven, becomes six. Eight becomes four and three. Six becomes seven and one. Five becomes two and eight. Seven becomes nine and two. Or as the I Ching says "is complemented" rather than

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becomes. Or it could be stated in words, metal becomes fire and water, wood becomes earth and wood, water becomes metal and water, earth become earth and earth, fire becomes metal and earth. Translated into notes we have (Sol), (Do), (Fa), (Ti), (Mi^b), (Mi), (Fa), (Do), (La), (there is no note for five in the I Ching System) (Re), (Ti), (Do), (Sol), (Re).

This series on the I Ching, give a sort of flesh and bones to this work. It brings the symbols back to direction, movement, color, seasons, elements, parts of the body, the everyday world of lake and mountain, journeys, thunder and wind, fire, and things of earth. It, also, is carried further, by reading each chapter signifying the note numbers it would give one a whole philosophy of behavior, a psychology of human response, fears, loves, hates, adventures, states of being required for different times, and extolling of CHANGE, which is as natural as the waxing and waning of the moon, and how to meet it. It gives a spiritual direction to those who turn to it for that end. It is a bible of meeting change spiritually and psychologically. It is not really, as so many think a fortune telling sort of book. It can be read with great enrichment as one would read any book on spiritual growth. As I mentioned before, it is the number system which makes it of great use in symbolic analogy.

The I Ching diagram is very similar to a chess board. We could have used a chess board to yield analogy, with music, except that the motion on the chess board does not have a definite sequence. Its laws are based on skill, and chance. The element of chance in the I. Ching is found with the use of yarrow sticks or coin oracles. But one can completely eliminate this part of it, as we have done.

PROGRESSION BY SQUARES. (RE. ILLUSTRATION P-46).

This drawing indicates a progression not only by square shapes, but also a progression of some of the ideas portrayed in this book. In illustration P-6, for example, just before the folding and unfolding square the macrocosmos and the microcosmos is portrayed. This could be interpreted as a point of expanding or contracting before a folding. This change of scale occurs at the sixth square, the (Mi^b) square. The first square is Illustration one, the seed within which is found the totality of existence. Time folding backwards into the seed. It incorporates the idea of the universe as being basically a music. We have dealt with the music of the worlds, in the aspect of number and measure, at a very elementary and basic level, which does not preclude the omission of many essentials in mathematics. But briefly, we dealt with number as if each number were on its own orbit, with the distances of the orbits from one another paralleling the distance of the planets from one another, as if (Do) or (C) were the sun. (Illustration P-2). We saw how one right angle can create triangular lines of force, that one side of a triangle is a dividing axis, the other a multiplying axis. (Illustration P-3).

We saw how certain numbers can rotate in a circle, and come back to themselves, after thirteen steps. (Illustration P-4). We saw how numbers could be counted as vibrations on a stretched string. (Illustration P-5). (If analyzed, these show an adding to three notes, until we come to the ratio (4/3 (F)) 1024, at which point we go back to 256, and add to obtain 1280). And we find that 512 and 768 also equal 1280. From this step, which is the fifth, we must add 256

again twice to the preceding 1280 to obtain 1792, (E^b). We saw how we could set up a crossed diagonal, the multiplying element being on one side, the dividing element being on the other side. (Illustration P-6). We saw how number could be extended by rays (Illustration P-7), and divided by segments (Illustration P-10). We saw the possible relationship between time values of seconds, as laid out along a line, as in a music score, and fractions representing notes. (Illustrations 11, 17, 19). We took a whole field of note numbers and laid them out in an array of ascending and descending fractions, (Illustrations 13 & 14), and wondered at the patterns formed, as we put these on orbits representing overtone and overtone. We pretended that groups of numbers could be folded in such a way as to yield a sequence which would fit into a pattern of dots as laid on a grid. (Illustration P-14). We determined which notes would fall on which orbits when opposing circles were drawn from an end of a cycle, and from the beginning of a cycle (C to C). (Illustration P-15).

We found that dividing by halves on radii signifying circular orbits yields results that correspond to the sequence of notes, but the changing direction of movement is what caused this correspondence. (Illustrations 18 & 20). We made number correspond to direction. (Illustration P-25). We gave lines lengths and direction by using the patterns of multiples as the determining factor. (Illustration P-26). We extended lines standing for octaves and thirds to make certain patterns. (Illustration P-27). We assigned to each number of dots within an orbit a physical and a metaphysical meaning. (Illustration P-28 & P-32). We tried measuring proportions as if from two right angles, divided proportionately into divisions which correspond to the musical ratios, and then we tried
reversing the proportions (signifying time) at the other right angle, opposite. (Illustration P-33). We show how points on spirals can be either expanding or contracting, representative of the eye and ear in actual form. (Illustration P-34). We showed how seconds could be coordinated with distance, a known law, and how this fits in visually with the total picture of the progression by squares, and showing how each musical note fits into this picture. (Illustration P-35).

We proved that the patterns of notes, numbers, laid out on the I Ching square grid, fits into the same sequence of number-note relationships as other systems we tried. (Illustrations 36 & 43 compared to illustrations 48, 18, and 20).

We saw how we could create shapes based on the polygons (number of sides determined by the ratios), and we could also determine angles of each note in terms of acceleration (based on Ouspensky's theories).

We saw from other I Ching ideas how numbers could be related and balanced by seemingly asymmetries. One to six, two to seven, three to eight, four to nine, the five being central to each set (i. e. 1 + 5 = 6). (Illustration P-40). This idea could be applied to the first order rotating around the circumference of a given circle, the second inner order rotating as radii, pointing to the outer order. (Illustration P-41). We see how each set must have a round, odd and square, even number, a merging of heaven and earth, according to the I. Ching. (Illustration P-42). We saw that each number must have a set of steps to complete a cycle. (Illustration P-43). We found that axii must have direction, called in this case evolution and involution axii. (Illustration P-44). We have not dealt with weight to the extent we dealt with number, as it should or would have to be dealt with to illustrate the sounds physically. Each string, (if we used strings) would have certain tension to it to reproduce the wanted sound. We have made only very sketchy analogies to planets, but have used extensively the idea of orbits. We have determined direction and pattern as if we begin with a static planet universe. We made conjectures about the character of Jupiter, the note (Mi) and (Mib), which occupies a crucial spot in our system as either a reverse of motion, or a change of scale, or a mirrored illusion of the planets nearest the Sun. Motion was never specific speed, but the idea of motion is constantly with us in either rotating spheres, orbits, spirals, see-saws, interlocking circles, vibrations of all sizes, expanding, contracting, zig zags, angular accelerations, folding, flows, oscillations, pulling and pushing motions, ascending and descending, growth, galaxies drawn into a source, implosion, explosion, rate of acceleration by falling, and transformation of one number or material or note into another.

In terms of time, we discussed the Mayan Katon Calender, with its intervals of 20 year periods, one unit of 13 sections equaling 20 years. We discussed time as vibrations per second, even melody becomes pulse, while pulse becomes melody above 15 vibrations per second. We looked at the possibility of denoting space in terms of time by equating note ratio to time as having the same fractions. (Illustration P-11). We saw how time could be denoted by a line of dots for each second. Each note could signify any unit of time, such as 20 year periods, if applied to the Mayan Katon Wheel. As an example, 260 years would be the length of the first octave cycle of 13 notes. (We determined a cycle, if it encompassed an octave of sound).

Therefore, the entire cycle of the 53 notes on the ladder of sounds would be completed in 640, 000 years. We determined that the time side of a square is the inverse of the space side, and that we have to use different measuring rods for each, as the numbers included in the squares vary. In a different sense, we decided that an angle between two right angles would compose the time dimension. We tried to equate a given note on the scale with a quarter, eighth, sixteenth, etc. duration of time. We decided that where two forces overlap, the acceleration must decrease. We dealt with the seasons as time in the I Ching, with units of four.

To go fully in to the time aspects of this would mean another book so for now these are just suggestions of this aspect. We would have liked to speculate, however, on the idea of 1/10 of a second being a crucial element of time in regards, at least, to our perceptions. For it is not only the alpha rhythm of the brain, but also the crucial interval in the perceptual process as the minimum quanta of time experiences. ¹³

1/10 of a second is the sweep of ascending and descending wave in sound perception. In the I Ching, we could apply the unit of ten as being a 1/10th of a second, as it found in the four bars of ten units in the modules constructed on the principals of the INNER WORLD AXIS. This modular unit could also very easily form a four sided square, instead of a rectilinear solid. The four sided square would remind us of the folds of a Mobius strip cut once down the middle, or the four seasons.

The music of humanity, we have left almost untouched. This again, could be expanded to another book. Life and death, body and soul, are the studies of a lifetime of living. We conjectured that the infinite is

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inward, the eye which looks on our world is blind. We took as humanity, the earliest beginning of the Chinese, the Greek, the Mayan, to discover how they related music to the senses of color, and to see if we could fit our system into theirs. We could. Rhythm is only based on the heart beat, we said. These are the rhythms which we can actually use and reproduce. The larger rhythms and the smaller rhythms we can only consider abstractly for the present, as lying outside the domain of our senses, but nonetheless there. We have really only drawn a possible map which extends to the beginnings of number, music.

Human, God, immortality, perfection, being, good and evil, the visible world, imploding, exploding, the void, cycles, changes, these all were only suggested, But if we can draw anything from all of this, it is that our visible world is the point at which motion on the surface has ceased. Within our bodies there is motion. without our bodies there is motion. Are we and the entire visible worlds of, organic life, the world, the stars, the galaxies, the nodes of creation, the points of non-motion on the vibrating string of creation? Are we, then, and our entire visible world the realms of the dead, the motionless, the stagnant, the static, where, in essence time has ceased to be, so we must create it, so that it encompasses our still state? Does this then mean that there is no beginning, and no end, no space and no time, but only vibrating motion and nodes of silence and stillness? Therefore, seconds, minutes, hours, days, weeks, years, centuries, millenniums are all one. Why are the stars so fixed in the sky since the beginning consciousness of mankind, if this were not so? The stars and galaxies, could they be the fixed points on tensely drawn invisible strings, plucked by invisible forces, each vibration causing a different quality of sound and shape, and sequence and pattern.

So the music of our earthly instruments mirrors as closely as anything in this visible world of ours the universal harmonies which exist in the universe. Again, the specific study of the music of the instruments would take another book, dealing with the science of acoustics, coupled with the science of esthetics, harmonics, overtones, undertones, emotions, intuition. I do not mean to imply that this has not been attempted. It has. But if it could be redone with the idea that all is one plan, one puzzle, that each part fits into, to create the whole design, it might elucidate our concept of the universe, our concept of our place in the universe, and even our purpose within it.

Therefore, this study proposes that we restudy everything from the beginnings, as though we knew nothing of what we think we know at this moment. It proposes that we concentrate more on the unknown, rather than the known aspects of physical phenomena. Perhaps it means reinventing the wheel. Perhaps it appears to be going backwards. But we must reassess everything. It is the only hope, as we see it, of realizing our oneness with the universe and humankind. It is time that our lives became not fragmented bits of separate egos competing for shadows of security acceptance, power, wealth, prestige, but organic parts of a totality of which we, as thinking feeling organisms, have a major part. The consciousness of the human race is at stake. Not only the consciousness but the happiness and the longing of the human race for a fulfillment of a spiritual nature is imminent. We are the conscious nerve endings of a power of creation which is trying to use us as instruments of a higher calling, instruments by which the force of creation can know itself.

The outside world exists only in so far as our

EYES + EARS = IDEAS

imaginations conceive it, or our perceptions acknowledge it. If we extend the boundaries of our consciousness and awareness, then the outside world expands with it. What is outside and what is inside are the same, the same patterns, the same structures, the same cones, trapezoids, spirals, diagonals, vibrations, squares, triangles, circles, colors, lights, darks, textures, intervals, all on a smaller scale.

The functions of an organism exist in a circular pattern. The harmony of synchronization of parts make a whole. We as individuals are both whole and part, ideally synchronized with the rest of humanity, as well as with the overall cosmic harmonic structure of the universe itself. Isolation begins when the individual separates the self from the natural universal order of these harmonies, and considers the part in itself, the whole.

To plug each nerve of each of the senses into the outlet of the underlying creative force of the universe, we are carried along to participate in the destiny of the human race, as instruments of a higher power. Are we able to think of ourselves as only sections of huge dimension which extends beyond the ability of the present imagination to grasp, a section like that of a slice of an invisible body? Just as a slice of an apple give as a pattern entirely different from the found whole we see, a slice of our "spectral" body gives a pattern of ourselves as seen only with the organs of our eyes, an imperfect and misleading whole, which some of us mistakenly call the "real world". If a circular form most of us could acknowledge is that of the half circle from birth to death, if we go further and turn it around to be the circle from death, our present state, to life, we could still stagnate in still pools of waiting whether for life or death. But as each of us

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consciously tries to fulfill a purpose, which each of us was innately given, if each of us consciously tries to submit to our destiny, by turning all of our being and our thought to this end, then surely what we search for will be found.

If we can approach the next few illustrations with all of this in mind, realizing that what we seek is an answer to all sorts of questions, and to try to see if what we have so far discovered relates in any way to fitting the parts of separate knowledge together, so that without being specialists, we may have at least a sense of the searching for wholeness, we will continue with this most important sequence, a progression being likened to a falling body.

Let us try to imagine that we are on this falling body. We have been INVOLUTING, so to speak. We have taken six steps in the involution process, as though we were accelerating like a falling body.

When the center of this involution motion is reached, and the velocity is greatest, we find ourselves in the area of dissolving into nothingness. (On the musical scale Eb).

The pendulum swings back and forth in an oscillating motion. We find ourselves on a radius of a circle, where we would hear repeating tones (Do) to (Sol) to (Fa) to (Mi) to (Mi^b). If we look outside this radius we would see something zig zagging into the circle. These zig zags are as a sound cone on the universal ladder of sounds. We originated from the first, and as we swing into the center of the circle, we see the others touching each expanding square on our radius of life. So we might realize that the vibrations travel along these jagged lines leaving the nodes or points of stillness at

right angles to one another. We see the pyramid shapes of Egypt, and see that the limit is reached at the note (Fa)/(Mi) (81/80). Then, we are pulled from inside to the outside, as if we were a glove being pulled off. The PRIMAL ARRANGEMENT has been transformed to the INNER WORLD AXIS. The end has become the beginning in an astonishing series of folding into a triangle. It is this triangle which becomes the generator or the seed pattern of the clusters of sounds, which we see as spheres, the diagonal line, being, of course the harmonic line on the breadth of the triangle. The folding backwards on the dark strips, only indicates how the ever expanding cone, by folding backwards on itself remains the same size always. Only the density changes, as it expands and folds, it becomes less dense, and slows down. If density and weight have anything in common, we then have, dealt with weight.

At the rim of the cone acceleration almost ceases. Is this the rim of the galaxy, the milky way, our sun, our earth, ourselves, our motionless state? Do we now have a visual image of the vibrating strings of our galaxy? Is it a section of a funnel with invisible strings of force pulling it towards a black hole point in space?

CORES CONTRACTING EXPANDING. (RE. **ILLUSTRATION P-48).**

If we old see this galaxy, as if it were a flat disk, this diagram might give us a clue to the visual interpretation of universal harmonies as applied to our galaxy. Remember, that it is in eight contracted octaves which we have discovered to enclose the entire universal ladder of sounds. We arrived at this by the discovery that the origin of the CIRCLE OF FIFTHS was by no means arbitrary, but was based on

mathematical laws. It is in this diagram, which can actually be played as music on the staff lines across the diameter, the we can apply the principals of the Mayan Katon Wheel, the zig zag motion from one end of the circle galaxy to the other. In this case, however the radius (time) constantly changes as it runs in a counter-clockwise direction across the expanding and contracting surface. As we mentioned before, the motion appears to be inward first, to an accelerated speed and increased density, to the point where it disappears in the center only to reappear as force in an oscillation expanding, contracting motion at the rim. All of this motion is base on the principals of halving the radius, or call it time, or call it harmonics. We found that the mathematical ratios of sounds in music did correspond spatially to the same ratios, undivided this way, in terms of angle, string sectioning, etc. In fact, the staff, indicated here, could represent strings, of a sort, plucked at specified points by the stars within the galaxy.

COMPLETION OF CYCLE. (RE. ILLUSTRATION P-49).

The inner tube image of the oscillating area around the rim, represented by the notes (Ti), (La), (Re), (Do), suggest a visible three dimensional world, a balance of little acceleration, a little density. Within this tube, the angles indicate an accumulating acceleration. From (Do) to (Sol) to (Fa) to (Mi) to (Mi^b), we have an equilateral triangle, a Mobius strip of the first twist, pressed flat. A terraced layer suggest that different dimension of the tube. The second terraced layer suggest the limit of the tube, whereas, each successive layer suggests more space, less density, and a folding backwards, like an accordion fold, springing from the center of the circle, and in essence obliterating half of

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it, if it were to be actually folded toward the center.

PROGRESSION BY SQUARES OVERLAPPING IN AN (S) CURVE. (RE. ILLUSTRATION P-50).

This illustration suggests how the radius of progressing square might look, as it swings in an S type curve across a diagonal. The seed pattern, then, is generated on another plane to that of the square progression. The I Ching symbol of PRIMAL AND INNER WORLD ORDERS indicate the two different ways order is originated, and provides a key to unravel certain of its mysteries. Perhaps we could think of the PRIMAL ORDER being the first stage of EVOLUTION, and the INNER WORLD AXIS being the INVOLUTION AXIS, THE POINT AT WHICH THE GLOVE OF THE UNIVERSE IS PULLED INSIDE OUT. So, the key can only be regarded in relation to itself. If the whole work is contemplated as a moving diagram, a pulling in and a pushing out of forces, a study in the different balancing of number relationships, it may yield its secrets.

FIVE STEPS. (RE. ILLUSTRATION P-51).

Integral to the Chinese philosophy of number is the number five. Five is the center which balance each of the nine numbers. One to Nine, Two to Eight, Three to Seven, Four to Six. As we remember, the INNER WORLD AXIS when put together as a unit becomes a whole, very different from the fractured look of the PRIMAL AXIS. The number five, as well as signifying MAN also the five senses, five fingers, toes, could also mean steps or sequence toward fulfillment. Usually we have dealt with sequences as a progression from small to large. Even though (Do) is both the small and large, the beginning and the end. In this case (Do) is the smallest, as if it were the puncture in a tube to be turned inside out. As the inside is gradually pulled through, we should have more area for each note, until we reach a point where we had pulled half of the area through, and the size of each area representing a note would correspondingly diminish, an EXPANSION CONTRACTION.

If we go back to the beginning of this work where we decided that one set of measuring rods measured an expanding set of points, and another set of measuring rods measured a contracting of a given length, we could take a gigantic step of the imagination to visualize, that the two apparent opposites are really part OF THE SAME PROCESS, THE PROCESS OF PULLING THE UNIVERSE INSIDE OUT. What is more is that in five pulls, five stages we could reach our natural limits.

DIAMETER OF EACH CIRCLE SECTIONED BY ITS RADIUS. (RE. ILLUSTRATION P-52).

Now if we imagine we can cut through sections of this process of pulling inside out, we might have something which looks like a circle, divided into six equal parts. This division is one inherent in the construction of the circle itself. In other words the unit by which a circle can measure itself is BY ITS OWN RADIUS, WHICH DIVIDES ITS CIRCUMFERENCE INTO SIX EQUAL PARTS. When we draw a circle, starting from the smallest at row one, or (Do) and with our compass, set each point on the circumference of the circle, each end equidistant from an imaginary horizon line, or diameter, we find that as we progress, step by step, to each row, and mark off each rim of each circle, we have a wavy line representing either contraction, going in, or expansion, going out. This not only ties in with what we have been thinking about just before, but gives us some visual proof of vibrations which we see move along the radial axis. We see very definite sine curves taking shape in different scales. The sine curve is the curve which expresses each harmonic note in music. At the same time we have somewhat jagged lines which would connote noise. We also, carrying our logic still further, felt that the adjacent areas must be the inverse of one another what was white in one, being black in the other, symbolizing either space vs. object, or degree of acceleration. The latter is probably more likely. If we apply this idea of acceleration to the diagram, we could take as a guideline the acceleration of the rings of Saturn, for example.

The first five, we will say, revolve at a given speed. Then twice as far out from the center the next will revolve at 1/2 the speed of the first. Then at three times the distance of the first from the center, the next revolves at 1/3 the speed of the first. Then, four times the distance of the first rings from the center, the last revolves at 1/4 the speed of the first. The three outer rings, then would be in unison at the 12th time. The first of the three outer rings would combine every fourth time. The first two of the three outer rings would combine every sixth time.¹⁴

If each of the three rings represents four, six, and eight seconds, minutes or whatever unit of time we calculated, we would have a moving form of synchronizations which would have its own speed, and would stay within the limits of its own speed path. If the first cluster of rings, close to the center, represented the cluster of seed notes up to either the eight or sixteenth rows in our system, the entire octave cycle of (Do), the subsequent notes might be those

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which fell on the rows in their spatial proportions from the center. Interestingly enough, the notes thin out, as they move further from the center, less dense, slower motion, longer length, less curvature of space. TIME IS AN EXPANSION OF SPACE SPACE IS A CONTRACTION OF TIME. It may be that our physical senses can only apprehend the first wedge, which would be our three dimensional world. The five other sections could well be the dimensions beyond our physical perceptions, existing yet unbeknownst to us.

EXPANDS - CONTRACTS. (RE. ILLUSTRATION P-53).

We play with the idea of the different patterns on a curved field of notes. It is remarkably obvious that on the curved field we have great differences in expansion where the notes are, and contraction on the rows where they are not. It is very obvious that from a space filled with sixteen small balls, each representing a point, that it would take more balls than seventeen in the seventeenth row, and eighteen in the eighteenth row to fill up the triangular shape of the wedge, wherein is contained our first octave of notes. Curiously, at the nineteenth row we have a sudden expansion, from a contraction, in an area of no notes. Obviously, a limit of sort has been reached, visually, and it is no surprise to find it the natural limit of the octave.

We could carry this through the 32, 000 balls necessary to construct a total picture of the universal ladder of sounds, if we had the time, the patience or a computer. And we would see from this the ever increasing scope, or length, the increasingly less dense field of notes, inevitable contractions or larger and more energetic chunks of space, which we would of course be unaware of, as a whole field expands and contracts to it's own scale. It is not merely a coincidence that this illustration bears a marked resemblance as the inner workings of the CIRCLE OF FIFTHS, earlier mentioned, the spiral like opposites of space and object on either side of the pseudo-sphere, the space curving back upon itself, at its most dense and fastest speed.

If we fold the sheet of paper into a tube, with the opposite ends of the circle meeting, we might have an idea of how the beginning become the end.

CONCAVE - CONVEX. (RE. ILLUSTRATION P-54).

This brings us directly to the problem of concave shapes versus convex shapes. The whole concept of concave versus convex shape, is one in which we might have to consider different factors working, a different pattern forming. The convex, or going outward, might seem to suggest an expanding surface, while the concave, or going inward would lead us to the idea of a contracting surface. In the one case, we would have the ascending scale, the increasing radii, the expanding sphere, the infinite number of points. In the other, we would have the descending scale, the diminishing radii, the contracting sphere, the finite measuring rod, such as our common ruler, but with an important difference that IT WOULD MEASURE FRACTIONS NOT INCHES, AND WHAT IS MORE, FRACTIONS BASED SOLELY ON THE RATIOS OF THE UNIVERSAL LADDER OF SOUNDS.

Paradoxically all appear as they would be drawn on a negative curve, on an involution and an evolution axis. So what we might have concluded is, that it is the

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spaces between the circles which might be as stretched strings pulled across the universe, in the spaces between the visible round objects we call planets, suns, galaxies.

Each of these webbed structures would be composed of the number of strings complying with the number of notes, based on Arnoud's mathematical cycle of dividing 81 (9 x 9, God in numerology and Fa/Mi in music 81/80), and alternatively subtracting and adding the subsequent notes. When rearranged in a certain order we might have a total picture of the inner workings of universal forces. And I leave this up to the fertile imagination of the reader and others to complete.

TIME - SPACE. (RE. ILLUSTRATION P-55).

If we go back in our minds to the TIME SPACE CHARTS we might remember that the time side and the space side each had different numbers, when we counted the equidistant dots, on triangles drawn from each side to form slightly disjointed squares. If we remember that the numbers on the space side were 13, 11, 7, and 3 and the numbers on the time side were 15, 9, 5, and 1 we would be able to determine time with one set of numbers representing a contraction (TIME IS A CONTRACTION OF SPACE), and space with a set of numbers representing an expansion (SPACE IS AN EXPANSION OF TIME). The numbers in these cases we will note are entirely odd. That in itself is remarkable. Remember we took as our limit, eight dots, totaling 64 dots, the number for (La) our void, our asteroid zone, and within this framework we were able to find each note in the octave with the exception of (Fa), although (Fa^b) could be considered equivalent to (Mi), in which case we would even have (Fa).

We should also remember that odd numbers represent heaven in ancient Chinese mysticism, and even numbers represent earth. So we have a set of numbers representing time and space, and things of this world and things not of this world. If we analyze these numbers we come up with some fascinating thoughts. Firstly, both sets are formed by addition of four for TWO STEPS. THEN THE THIRD, OR LAST STEP IS FORMED BY ADDING TWO ON THE TIME SIDE, AND SUBTRACTING TWO ON THE SPACE SIDE.

In terms of musical ratios, one of the notes on the space side is the (Re) at 8/7. (13, 11, 7, and 3). Oddly enough this is the note which symbolizes expansion, the rim of the circle, the largest expansion when ripples meet. If we say that an expansion equals space, we then have one link with the spatial dimension on one side of the diagonal. The equation balances because the expansion has to be cut down to balance with the time side. (Ti), the contacting factor, whose ratios to (Do) are 5/9, 8/15, 16/9, (15, 9, 5, and 1) are on this time side, so adding two would balance this side which diminishes.

As for the practical application of any of these theories, they must be left to those who can manipulate computers, and higher mathematics. In fact, there might not even be any practical application. In any case if these ideas can stimulate any kind of creative thinking about any one of the myriad subjects we have merely touched upon, the aim of this book has been met. Its purpose is to stimulate a different way of looking at familiar phenomenon, a different way of reasoning, a different way of approaching complex problems, not with ready made formulas, but with a fresh viewpoint. Of course, all of this will be disregarded by some, and accepted by some. That is what it is meant to do. As we said before, in no way is it meant to be definitive. It is both fantasy and fact. It is a creation of a whole world from nothing, with its own imagery, its own mathematics, its own logic, its own vocabulary, its own symbols, peopled by abstraction, dream and reality combined.

It has formulated its own science, its own literature, which continuously refers to itself. It has conceived its own seemingly soundless musical scale, and music theory. It has constructed its own view of the origin of matter, the stars. It has developed its own concepts of time and space, of man and mortality, perfection, good and evil, which are really nothing but number. It has invented its own mechanics, its own philosophy. It has made up its own charts and graphs, its own numerology, and astrology, botany and theology.

In the process of doing all of this, it has mirrored civilization, on a very small scale. It has emerged from the ooze of beginning consciousness and tried to reinvent language, number relations as though it were the first being trying to manifest itself and reinvent the world, in the hope discovering what might have gone wrong. It mirrors a search for the phantoms of our consciousness.

KEY. ¹⁵ (RE. ILLUSTRATION P-56).

This final illustration shows how number was the KEY to this whole work. It bases this on the idea that there are 53 harmonic intervals in contracting octaves. This means there are fifty three fractions which, when analyzed and arranged in certain orders, can give us a key to unlock the mysteries of sound, object striking, plucking, blowing, bowing, clashing object. Thus the mysteries of sound, in turn can reflect the workings of

all phenomena, both physical and metaphysical. By turning these fractions into shapes, by setting them up on grids, we are able to see certain patterns with the organ of our eyes, instead of hearing them with the organ of our ears. In other words, we make an invisible structure visible, we see the heard. Granted that the gird structure has its limitation, and does not necessarily reflect reality, still it enlarges our powers of perception. Ideally the grid might have been more accurate if we had actually used spaces not equidistant, but of three unequal sections, reflecting in themselves the inequality of the fractions as they progress in an ascending descending pattern. Only the middle section would be whole, a one. The one above would be greater, the one below less than the whole, in terms of having either more or less space between the dots. This then might have created a truer image in terms of the values for the fractions. With a vaster knowledge much more could have been included. If everyone in their own field of interest could explore the possibilities inherent in this method it might prove very fruitful. It is obviously beyond the scope of one person to handle adequately. However, one should not ever be afraid of encroaching on another field because of lack of experience. All knowledge should be available to everyone. Number is available to us all.

This whole effort is, of course, nothing less than trying to express number spatially, which was abandoned in the time of the early Greeks, who thought space was incommensurate with number. Therefore, we are trying to prove that number is not incommensurate with spatial symbol. That, in fact, spatial perception is perhaps more accurate than an abstract number alone. We believe that spatial perception has not been developed highly enough, and has therefore been considered inapplicable to deal with the problems we

have been concerned with. We believe that a spatial thought sense is the organ of the future. We believe that this spatial thought sense, when developed, will raise the consciousness and perception of the human race. We believe that thought has form and shape, and balance and color, and sound, texture, and rhythm, and dark and light, and motion, and interval, and that the highest form of thought is pure abstraction with visible form and structure.

And so we have named this work GLIMPSES OF THE BRIDGES OF ART. For art is a microcosmos of all that goes to make up life. It is not a specialized field relegated to its special corner, but it has license to encroach without impunity on everything which falls within the mind's grasp. And with it comes imagination, emotion, fantasy, structuring, creating an order where none existed before, an ecstasy of GLIMPSES available to everyone.

THE END IS THE BEGINNING.

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SIC ARTS (1 = 28)
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GLIMPSES OF THE BRIDGES OF ART

BY BARBARA HERO

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EYES + EARS = IDEAS



ORBIT OF PLUTO

Pluto represents the diameter of the circle within which the optical order of

the planets lie... To fit into this order the pattern of musical harmonic intervals become ever expanding snake-like curves...



DOUBLING - UNDERTONE / DIVIDING - OVERTONE

If one folds each circle to its counterpart... red to red... blue to blue... orange to orange... the fold lines lead to a single point... representing the contracting element ti or Saturn...

MAYAN KATON WHEEL

The Mayan Katon wheel is divided into 13 sections... The pattern of notes can fit into this wheel... See illustrations P-13, P-5, P-19... Each color represents a note and a planet





VIBRATIONS OF A STRETCHED STRING

The harmonic ratio of each note to "Do" might be depicted in this way... See... "Musique Platonicienne... Ame du Monde", George Arnoux.

MACROCOSMOS MULTIPLY... MICROCOSMOS DIVIDE

The multiplying element is on one half of the diagonal fold... the dividing element on the other half... The zero point (the diagonal) forms either a crest or a thought...





VENUS MAD. EYES + EARS = IDEASPage #: 3 - 9

COLOR SPECTRUM... MUSICAL INTERVAL... PLANETS

The inner eye looks inward to the tube surrounding the music spectrum... See illustration P51... the progression of five steps to Mi.



CHINESE COLOR SCALE

Chines Color Music Scale vs Pythogoras Color Music Scale

CHINESE		PYTHOGORAS
Do-	Orange	Red
Re-	Green	Orange
Mi-	Lavender	Yellow
Fa-	Red	Blue Green
Sol-	Yellow	Blue
La-	Blue White	Lavender
Ti-	White	Blue Black
Do	Acra Violet	Acra Violet

COLOR NOTE VIBRATION SCALE

A given length of a string divided into its proportions of musical intervals...

ILLUSTRATION: P-10

Note of String Segments of note uppertunes EYES + EARS = IDEAS

G

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VIBRATING STRING

The vibrating strings were enclosed in a circle representing space... The other half of the circle represents time...

Rhythm plays on the boundary between the extension of the pulse beat to the quickening of the pulse...

The notes are all multiples of 3 or 2 with Fa being the only inversion, possibly due its being the fourth on the ascending scale of fifth or the descending scale...

FIELD OF OCTAVES Overtones... Undertone

As a pebble is dropped in the water, the ripples fan out... the ripples from another pebble meet...

1/2 of total area is Re 8/9 or Mars... 1/2 of Mars to Do (Venus) is La 5/8 or asteroids...

1/2 of La touches Fa 4/3 Mercury... 1/2 of Fa becomes Sol or Earth 2/3...





FIELD OF OCTAVES OVERTONE UNDERTONE These are the key patterns of the progression of vibrations... The basic

shape is triangular... (a mirror image was laid on the other side of the diagonal to form the pattern) ... A grid was set up... 1/1, 2/1, 3/1 ... etc. The harmonies fall along the diagonal... Do 1/2, Sol 2/3, Fa 4/3, Mi 4/5

SPACE FOLDS ON A FIELD OF EIGHT

Space folds on a field of 64 dots (eight x eight).

A diagonal drawn between equidistant dots creates space on one side... (3) time on the other (1) See illustrations P-18, P-19, P-20, P-21... La or asteroids make up the time

side...

All the other notes plus La make up the other half...

By first folding under the time side then by folding the remaining triangles under the space side...

TIME FOLDS BACKWARD INTO THE SEED FORM

ILLUSTRATION: P-14

Ti^b is 9/16 Re^b is 9/10 Mi^b is 5/6 Sol is 2/3





RE EXPANDS

Curved lines were placed on a square grid...

The curves were begun at the 1/1 point and continued in ever enlarging arcs to

the 16th point (the Ti-Do)... Where they intersect, the pattern of notes found the ratios ... At the 16th point the curves were reversed and flow

towards the beginning... A small core was found at each point... The Re area represents the most extreme expansion... MARS OR RE EXPANDS

PASCALS TRIANGLE

Lines were drawn on 8 axes corresponding to the ratio of each note. The spacing was 1/16th of an inch for each axis...

The numbers of each axis began with 1 at the perimeter of the red area and were constructed according to Pascals Triangle...

1-- 1, 2, 1-- 1, 3, 3,1,-- 1,4,6,4,1 etc.... The sequence of notes from Fa to the end of the cycle is from "MUSIQUE PLANTONICIENNE... Ame du Monde"... Georges Arnoux





SPACE FOLD CHART

Another way of measuring the intervals by distance could give the following pattern...

Using 60 points for 60 seconds as a base...

Wherever a fraction can be reduced to its musical equivalent (i.e. 16/60 to 4/15) a colored line or circle is placed... The order from zero to 60 is:

Ti - La - Mi (Flat) - Do - Sol - Re - Fa - Mi (Flat) - Do - Fa ...

By folding... the notes are placed at 90 or 45 degrees angles to the original... The mid-point is always the (Re-Fa)... the groupings are always the same or inverted...

INVOLUTION AXIS EVOLUTION AXIS (Orbit of Musical Divisions)

The Do orbit encompasses all the others... Each note on the harmonic series was divided by the preceding note... The involution axis proceeds inwards to five steps... to Mi (FLAT)... The sixth note La falls between the Do and the Sol... and the last two osculate from the Ti towards the center (involution) to the Re which expands outward to the evolution axis.



Birth of a gra spoce-time Harmon) (

BIRTH OF A MUSIC GALAXY

Birth of a music galaxy might occur when two circles intersect to form a core... The Do encompasses the total... The Do represents the longest time value...The Whole Note:...

> Sol represents the quarter note... Fa the eight note...

The two Mi's the 16th and 32nd notes... The inner circle represents the contracted octave of double fifths... which contracts toward the Ti... The spaces were chosen by the principal of halving the harmonics...

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Two

Circles come

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ORBITS OF MUSICAL DIVISIONS

Pulled apart on a Field of nine... The music staff shows where each note could fall in its orbit... on the space scale... C, G, F, E, E Flat, F, G and C...





CORES OVERLAPPING

The curves of forces meet at Mi (Flat)... much as ripples in a pond meeting and crossing... Within the core a transformation takes place which generates the whole pattern again on a smaller scale... At the juncture of the 5th wave Mi (Flat) the force is Greatest... so that the seed is regenerated at that point...

MAA 85 IMPLOSION BECOMES EXPLOSION When circles overlap... the forces seem to reverse and the cycle begins again ... This might happen at the point where the opposing forces meet... sige dir 1 15 Time 3 15 Space 4 is bisht MAN 5 15 15 projection 11 is New cycle dity

ILLUSTRATION: P-22

EYES + EARS = IDEAS

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CHANGING DIRECTIONS ... AN OCTAVE OF PLANT GROWTH

The direction of plant growth could be applied to musical intervals on a spiral...

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EYES + EARS = IDEAS

PATTERNS OF MULTIPLES OF 2 3 5

2	equals	(C F)
3	equals	(G)
5	equals	(A E B)
7	equals	(D)

A numbered square is set up with 10 points vertical... 10 points horizontal... It is numbered 1 through 100 going from right to left ...

Whenever there is a multiple of 3 for example ... a line is drawn through 3, 12 and 21 forming a vertical line ... The other multiples form vertical lines at 1 different angles... The green line Fa is the only one which slants in the opposite direction... (Fa or 4:3 is an inversion)... GALAXIES... Perhaps the pattern of notes on either side of the diagonal have a relationship to the pattern of galaxies... The movement of the notes could be inward to the zero point or outward

TRACE PATHS... The octave patterns and triads (thirds) could move inward if the octave represents the microcosmos...



ILLUSTRATION: P-26

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CIRCLE OF FIFTHS

This model reveals that the circle of fifths C, G, D, A, E etc.; corresponds to the optical order of the planets in the solar system... VENUS * EARTH * MARS * ASTEROIDS * JUPITER... Double fifths represent the ascending scale. The colors correspond to the Pythagorean theory of musical intervals and color.



TIME CHART

The following charts are based on this procedure...

Eight or nine dots are placed equidistant from one another... A straight line is drawn diagonally through the square not touching any of the dots... On one side of the diagonal the dots fall in this order:

ONE DOT REPRESENTS TIME FIVE DOTS EQUAL MAN NINE DOTS EQUAL GOD THIRTEEN DOTS EQUAL IMMORTALITY On the other side of the diagonal: THREE DOTS EQUAL PERFECTION SEVEN DOTS EQUAL SPACE ELEVEN DOTS EQUAL A NEW CYCLE


MAN SPACE CHART

The point of the compass is placed on one of the dots near the center of the diagonal equidistant from the ends... The diameter of the circle falls on the first dot on the opposite side of the diagonal... If the number of dots is two it represents implosion or explosion... If the number of dots is four... Jupiter or visible world is indicated... Five represents ... Man...



ILLUSTRATION: P-30

EYES + EARS = IDEAS







DIVISION OF STRING ON RIGHT ANGLE

The string is divided into 1/2, 2/3, 3/4, 4/5, 5/6, 8/9... Lines in the appropriate color are drawn from each point... A compass is also used to define the intervals from two opposite corners of the square... The web is constructed by having the numbers going from 1 - 2 - 3 - 4 - 5 - 8 - 15 on one axis and its reverse on the other axis. The circles show how each note finds its ratio.

EYE CIRCLE EXPANSION

EYE... (CIRCLE)EXPANSION...EAR... (SPIRAL)CONTRACTIONThe eye can represent the expanding
principal of looking outward (Space)...The ear can represent the contracting
spiral principal of inward (Time)...The descending scale can represent the
contracting scale spiral Do, Ti, Mi, Fa, Ti,
Sol, Do, Re, ...

The ascending scale Do, Sol, Fa, La, Mi, Ti, Re, Do...

1:1 - 3: 2 - 4:3 - 5:3 - 5:4 - 6:5 - 9:8 - 7: 8 -9:10 - 8:15 - 15:16...



ILLUSTRATION: P-34

EYES + EARS = IDEAS

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and the second states

MOBIUS STRIP

The principal of inside-outside or lightdark or positive-negative balances the concepts of ...YIN-YANG...

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I CHING HEXAGRAMS

The notes were found on the I CHING chart by putting each whole number in its position with color designating the note... Blue Green equals Fa... (81)... Yellow equals Mi... (42)... Lavender equals La... (64)... equals Ti... (56)... Black equals Re... (45 & 48)... Orange equals Do... (54 & 51)... Red Purple Black equals Ti-La... (60)

MUSICAL RATIO AXIS

This axis was based on Alain Danielou's... Semantique Musicale... the inside core was enlarged to form a web of the harmonic note...

opparing the second synchronic of the second s

SECTIONING OF CIRCLES

The shape of each interval was found by dividing the circle into: 1/2, 1/3, 1/4, 1/5, 1/6, 1/8 or 1/9 of a circle... Whatever the ratio of the notes were... The geometrical images were used...

Do is a circle or half circle... Sol a half circle and a triangle... Fa a triangle and a square... Mi a pentagon and a square... Mi Flat a hexagon and a

pentagon...

La a pentagon and a triangle... Re an octagon and a nonogen... Ti a pentagon and a nonogen... The harmonic order is on the diagonal...

ILLUSTRATIONS: P-38 & P-39

EYES + EARS = IDEAS

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I CHING PRIMAL ARRANGEMENT

Each trigram has a corresponding number from one to nine... In the primal arrangement:

One (Asteroids La) becomes six water (Mercury Fa)...

Two (Mars Re) becomes Seven Fire (Venus Do)...

Three (Jupiter Mi) becomes eight wood (Saturn Ti)...

Four (Jupiter Mi flat) becomes nine metal (Earth Sol)... Five (Earth Sol) becomes (Asteroids

La)...

PRIMAL AXIS INNER WORLD AXIS

See illustration P-47, eleventh square... it folds into a spiral if folded where shown... There are 4 space time dimensions (See space Time Charts illustrations P-28 to P-32) There are eight folds changing direction once at # four.





I CHING CHART (See illustration P-36)

One puts a circle inside the square formed by the hexagrams... The (DO) orbit "red" is at the diameter... The (SOL) orbit "blue" falls halfway between the center and the diameter... From this half one progresses by halves towards the expanding diameter... to the (LA)... then to the (TI)... then out towards the diameter again to the (RE)... See illustrations P-18, P-20 and P-48.





EYES + EARS

= IDEA

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ELD OF NOTES INVOLUTION-EVOLUTION AXIS

These fields were constructed by numbering the coordinate axis only as far as the ratios of each note... (8:9 equals RE)... Where each number met... the appropriate notes were placed... One axis must be an involution axis running toward the juncture of the axis... One axis must be an evolution axis going outward... Therefore the numbering must be reversed along one of the axis... (See illustration P-18)





PROGRESSION BY SQUARES

Each note in the harmonic series progresses in its order by squares... From one square (DO) the progression continues five steps until it folds into a seed to its beginning... The red (DO) "one-square"... It then unfolds to three blue squares... The distance measured from the corner of the four red squares (dotted line) to number five on the vertical axis measures three squares...

FA is measured by four squares... From the blue corner SOL to # seven... on the axis is 4 squares... MI yellow is 5 squares.

From the corner of the blue square to #7 on the axis is five squares... There is no equivalent to the sixth square... on the axis... The folding-unfolding square of seven is equal to the distance from the green square corner to number seven...

There is no correlation until one reaches the second fold... when from the yellow square MI one reaches nine on the axis... the equivalent to ELEVEN squares... The next, the I CHING of 12 squares, reaches #11 on the axis... There is no equivalent of #13 which becomes a folding in or the seed...

In the seventh progression the LA folds under... (See illustration P-14)... leaving DO the seed...

The eleventh square folds toward the center of the circle counter clockwise into eight equal sections...

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EYES + EARS = IDEAS



THE END BECOMES THE BEGINNING

The thirteenth and fourteenth squares represent other space folds where the circle is sectioned by its radius 60 degree angles from which develops the pattern of keys...

The wedge shape to the right represents the order of the progression by squares... The black areas are folding and unfolding.

EYES + EARS = IDEAS



CORES

CONTRACTING EXPANDING

The diameter completes a circle with eight octaves... (Eight octaves ascending - Eight Octaves descending) from middle (C) and going in contrary motion... The following four intervals contract by dividing toward the center (G) to (F) to (E) and to (E flat)... Then an expansion takes place from (D sharp) to (A)... Then a contraction of (B) halfway between (A) and (G)... and finally an expansion between (A) and (C)...

THE OUTER RINGS (D) & (B) EXPAND AND CONTRACT WITHIN THE VOID (A)...

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EYES + EARS = IDEAS

COMPLETION OF CYCLE

The shape of the pattern of keys is seen to fit into the 60 Degree angle of a circle... (see illustration P-47). Since the pattern of keys is terraced where the #7 and #11 fall an expanding inner tube inflates around the circle... this includes (DO), (LA), (FA), (TI), (MI), and two expanding (RE's) together...



* 2 6 18 8 1

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PROGRESSION BY SQUARES OVERLAPPING IN AN (S) CURVE

This is a three dimensional illusion of the progression by squares; (See illustration P-47) THE BLACK BAR WITH THE RED LINE THROUGH IT DENOTES THE CONTRACTING ELEMENT OF (TI)...

FIVE STEPS

This is a reverse image of the five steps from (DO) to (MI flat) in which (DO) was the largest circle within which all the other notes were contained... In this instance (DO) is the smallest circle... (SOL) the next... then (FA)... (MI)... (MI flat)... to (LA) which becomes the white tube surrounding the others... The seed like notes following the basic octave patterns are keys upon which this discovery is based.

ILLUSTRATION: P-51

EYES + EARS = IDEAS



DIAMETER OF EACH CIRCLE SECTIONED BY ITS RADIUS

The measurement of each radius around it own circumference divides the circumference into 6 equal parts... Expansion or contraction takes place at each row according to measurement... The first section forms six rings... The seventh is a void of expansion as (RE) is 7/8... The eight, ninth and tenth row form a group of three... expanding and contracting simultaneously ... The eleventh is void of expansion... The twelfth is (SOL) and (MI) interchanging... The 13th and 14th form a wider void... The 15th and 16th form the diameter of the circle (TI sharp) or (DO flat).





CONCAVE-CONVEX

The space between four circles is a negative sphere-like shape... Each circle has the key pattern of notes arranged according to a concave or convex shape... The web in the foreground is composed of 48 lines equivalent to (RE) 48...

TIME-SPACE

54 is (DO) the seed form... Space was constructed of 13 points... 11 points... 7 points... THE 13 AND 11 PLACES DO NOT HAVE NOTES ON THEM... 7 has (RE) only... (THE EXPANDING FACTOR)... Time is made up of 15, 9, 5, 3 and 1... (See time-Space Charts Illustrations P-28- P-32)





KEY

The first red square represents the first 16 points of the pattern of the ladder of sounds. 5/16 (DO) sharp or (TI) flat... A void of eight points occurs before the next sound... which is (TI) the contracting element... The next cluster is in a 16 point square with (FA) at 32/25... The following notes work backwards from (MI) 8000/6500... the spaces between the notes being much further apart... The furthest note out is (LA) at 32000/19683...

(THE VOID OR ASTEROID BELT)

STOP AND THINK

BY BARBARA HERO

When two and the interval of the comben shalls as you introduce progression to be a second as bible of the order of the intervals of the second and the field of the second and the standards to take the second mean of the prior content of the second of the second of the solid methy trace durates of the prior content of the second of the second of the solid methy trace durates of the prior content of the second of the second of the solid methy trace durates of the prior content of the second of the second of the solid methy trace of the second of the prior content of the second of the other field of the solid of the second of the solid of the second of t

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THE PAST CONTRACTS THE FUTURE EXPANDS 3" X 9"

When two circles intersect the numbers indicating a moving progression towards the center of the circles could form fractions such as those indicted in red. The unstable notes form the outer rim of one of the intersecting circles. B 3/7, D 4/9, A 1/16. The stable notes are at the core of the other circle. C 16/1, F 9/4, E 7/3 The colored checkerboard-like area is the core where the opposing circles either reinforce or oppose the direction of the other rings.

EYES + EARS = IDEAS

ILLUSTRATION: S-1

Page #: 4 - 2



PROJECTION OF A POLYGON 4" X 7"

This shows how the proportions of a falling group of notes can fit into a progression by cubes, through a simple projection technique. The only angles at which acceleration could take place are those indicated according to P.D. Ouspensy's theories. Re is 36 degrees; Ti is forty degrees; etc., according to the number of sides of a polygon. Five/six is the ratio for MI^b; the number six indicates the number of sides; the angle thus would be 60 degrees.

ILLUSTRATION: S-2

EYES + EARS = IDEAS

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PI EQUALS SIX 6" X 7"

Pi has usually been considered the diameter of a circle. This work presupposes Pi to be the radius of a circle. Therefore Pi for a hexagon would be 6.

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RE ORBIT... TI ORBIT... LA ORBIT

The notes were set up on a numbered grid, 1 to 81. As we see all the notes fall on one side of a diagonal. Fives notes, Mi 42, Do" 51, La" 60, Sol" 68, Fa" 76, fall on the rim of a circle. La 64, Ti 56 and Re 49 could be radii of different circles. Sol 36, Re" 45, and Do 54, Sol 72 and Fa 81 all fall in a vertical line.





THESE ARE SHAPES FOUND IN NATURE

The same measurements for an inside polygon of six sides, forms eight sides on the outside of the same circle.

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EYES + EARS = IDEAS

ILLUSTRATION: S-5

S-5

WAVE LENGTHS OF SOUND WITH RINGS IN ORDER OF PROGRESSION 9" X 9"

This drawing is an attempt to coordinate an orbital sectioning of the rings of notes by dividing by halves, with a wave motion. Both the sequence of notes, and the shape of the wave is asymmetrical. The birth of the notes occurs at the left rim of the circle, where the dotted lines show the zig zag progression symbolizing time. The note spheres were drawn according to the progression of multiplying by twos and threes. The curious inversion of Re to Ti, and Mi^b to La is something to be reflected upon.





INSIDE ... OUTSIDE

The red lines show how outside becomes inside as if a ribbon were around two balls. The portions blue, black, lavender and orange represent the outer rim of a circle, Sol, Ti, La and Re, in one circle and the yellows, and green circles indicate the Mi, Mi^b and Fa of the inner core. The color cone shows how the division is linked... the blue reds on one side, the blue yellows on the other.

BLUES GREENS SEPARATE OUTWARDS... REDS YELLOWS SEPARATE INWARDS

This drawing is based on some of Rudolph Steiner's theories of color. The color cone is derived from Yilmuz Hussein's color theories. The correspondence with musical notes is indicated.




BLACKS AND WHITES ARE BOUNDARY COLORS

This drawing is based on Rudolph Steiner's theories of blacks and whites bounding and enclosing space, and adjacent colors. The notes La and Fa are adjacent to Sol, as the colors lavender and green are adjacent to blue.



COLORS BREATHE IN ... COLORS BREATHE OUT... VIBRATIONS OF EACH NOTE

This drawing shows how each color and note can breathe in and out, as if each note were a ribbon winding along a series of spheres. Rudolph Steiner's theories was the impetus to the idea.

EYES + EARS = IDEAS



TRAPEZOID... (MULTIPLES OF TWOS AND THREES)

This shows how we can measure an angle by increasing by two on one side, and by three on the other side. Musically we find that fifths ascend on one side, the hypotenuse, and descend on the other side. When we draw wave vibrations starting from the top we can visualize how the note might look. We also might try to picture whether the wave increases by halves one way and doubling the other way, corresponds to a progression by squares or cubes.

TWO UNIVERSES BACK TO BACK (The direction of a current is counterclock-wise from negative to positive)

Angles and wave lengths are determined for each note. The shape becomes a yin yang.

It is the note Fa which finally achieves this shape. The note Fa is the beginning of the circle of fifths in music. It is #1 in the sequence of Chinese symbols in the Hexagrams of the I Ching...







VIBRATIONS ON FOUR DECREASING SOLIDS (The fifth contracts to a light force)

Each sphere decreases by half in a spiraling inward direction. Thus from time or pulse, the spheres become solid, then, only a surface, then a line and finally a point.



UNIVERSAL LADDER OF SOUNDS

Each wave increases from Mi to Fa to Sol, and as it does the force becomes less. One half of the cone is turned inside out. The notes therefore progress Re, La^b, Ti^b, Do, Sol, Mi Mi^b. The small dotted wave at the bottom denotes how the note pendulum sways as it swings along the wave. The NODE-MATTER indicates how the helix changes direction at the point of contact. One ring is non-matter... the other is matter...

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EYES + EARS = IDEAS

NORTH OR NEGATIVE POLE... SOUTH OR POSITIVE POLE

The line running from the poles is the harmonic diagonal of the earth in this case, or the brain in another case. Actually the arrows should have been reversed as there is more electron loss at the negative end of a dipole. This also shows how the brain might function as two opposing halves, one the reverse of the other. At the mid-point we might find one scale ascending the other descending, the overtone and undertone. The arrangement of musical gears is using those ratios used in music to determine the size of the gear and the number of notches.





A NEW RULER FOR MEASUREMENT

The most significant part of this drawing is the portrayal of time. At the line denoting PRESENT we see the future as one unit of measurement. The future is the point at which the past contracts to the present. The past contracts by halves until it reaches the present, then in retrograde motion proceeds unit by unit until it reaches THE EXPANDED FUTURE.





EYES + EARS = IDEAS





FOLDING BACK INTO A SEED

The dotted lines represent the orbits as they alternately contract and expand. The modules are based on the principle of folding a square into smaller and smaller triangles. The steps of the modules indicate where the grid would fall. Magnification in size of the modules must occur beyond the sixth step, as is shown. The change in scale coincides with the special aspects of each succeeding octave along the harmonic diagonal. The sixty degree angle is the angle found to contain the note clusters and their mirror images.





ANGLES OF EACH NOTE PUT ON AN ANGLED AXIS

We joined the angles with a web-like structure to see what patterns would be formed. Since the Mi-La area is always the crucial turning point in all of our systems, we had it twisted in space.

CLUSTER OF NOTES IN FIRST OCTAVE. (16:15 ON A FIELD OF C... (DO) 54...)

By putting the note clusters on its own field, we are able to see the patterns formed for each octave. If we establish the angles for each field, we find the sharpest curvature at Ti, the widest at Re... In fact, Re in essence turns itself inside out, as the complete reversal of Ti.



ILLUSTRATION: S-24

EYES + EARS = IDEAS

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DOES THE SOUND WAVE TWIST?

If the ribbons of waves twist as they travel outwards on the inside, two objects would be face to face, on the outside back to back. As the first wave or fundamental is generated, the second, or second fundamental implies two adjacent circles By drawing three circle within one circle, we can determine the 2/3 position for Sol, (two out of three circles),. The direction of the sound is away from the source.

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EYES + EARS = IDEAS



The overtones were kept within one octave instead of ascending as is usually portrayed. Planets were assigned to each note. Since we believe Pi is in some way connected to the harmonic diagonal as the radius of a large circle enclosing the field of C or Do., we have eliminated 6/7 as not to be considered in estimating the value of Pi/2. The undertone series rather than being a division of the string as in

overtones, is a lengthening of the string. Since physically this is impossible to accomplish, musicologists have estimated the notes to be as indicated. The Roman numerals indicate how the vibrations might fit into the thirteen spokes of the Myan Katon Wheel mystery.

ILLUSTRATION: S-26

EYES + EARS = IDEAS

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THINGS BEAR THEIR OWN MEASURE IN THEMSELVES... (OUSPENSKY)

Nine is the ancient symbol of God.

Nine circles were drawn overlapping at the center. Five is man according to ancient Chines mysticism. At the firth circle, where numbers 5 and 6 join, a circle was drawn tangent to the fourth and seventh circles. By taking the radius at different heights of each circle we were able to construct a triangle which seems to coincide with the proportions of Egyptian pyramids. By extending these heights to the circular form in the middle where space is on one side, matter on the other side, we then have a cross section of what appears to be types of magnetic belts. When we plot these according to the system we have developed, we find the stable notes falling on one side, the unstable notes on the other side. We also when drawing orbits from these different points find three crests of unequal placement on each side. If we think of these shapes as being convex and positive, on one side, and concave and negative on the other side.... we might have a picture of some of the workings of the universe...

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LENGTH OF STRING

The whole swings up... swings down... enclosing all... one half... one side... emptiness... the other ... fullness... one fourth... outside... inside... forces... two crests... one fourth outside... inside... forces... two troughs... two crests... four crests... four troughs... diminishing...

EYES + EARS = IDEAS

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MACROCOSMOS... MICROCOSMOS (THE ORBITS RESEMBLE ELECTRON ORBITS.)

The notes Do, Sol, Fa, Mi, Mi^b contract towards the center and then swing out in an explosion towards the void where they then contract to Ti, and expand again to Re. Wavelengths traveling on these orbits alternately contract and expand, becoming the past and the future, non-material and material, the macrocosmos and the microcosmos.

The curious thing is that it is the microcosmos at the core, the macrocosmos at the rim. The scale alternately ascends in an descending scale... and descends in an ascending scale. Modules indicating expanding radii whirl within the orbits. Trapezoids and triangles revolve about the centers of the expanding or contracting universes.

EYES + EARS = IDEAS



(A) EXPANSION CONTRACTION

Expansion - contraction... point... or ... segment, a line marked one to sixteen equal spaces makes a pattern... red, blue, green, yellow, yellow orange, orange, orange... doubles and expands. To dark red... Do... Sol... Fa... Mi... Mi^b... Re... Re... Do... Ti. A HARMONIC SERIES... Planets... Venus... Earth... Mercury... Jupiter... Mars... Asteroids... Saturn... Venus...

THE LIMITS OF EXPANSION... two thirds of Do is Sol... three fourths of Do is Fa... four fifths of Do is Mi... five sixths of Do is Mi flat... there is no six sevenths... seven eights of Do is Re... eight ninths of Do is Re... nine tenths of Do is Re... then there is space... fifteen sixteenths of Do is Do flat... from One to all worlds... to the milky way... to the sun... to the planets... to the Earth... to the moon... to the ONE... three in one... the beginning... the middle... the end.

EYES + EARS = IDEAS





(C) ANGLES

Angles... 60 degrees... spiraling... first... step... to... sixth... step... the La... the void... is the space between. 1/2... 1/8... 1/16... 2/3... 1/3... 1/6... 1/12... 3/4... 3/8... 3/16... 4/5... 2/5... 1/5... 1/5... 1/5... 1/5... 1/10... 8/9... 9/10... 15/16...

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(D) MUSICAL INTERVALS

Musical intervals... lengths of string... patterns... at the outer rim of the circle La, Ti, Re... move back and forth between Sol and Do... Ti contracts toward the center... black... Re... orange expands beyond to fall into the core of the next circle.

EYES + EARS = IDEAS



(E) ECHO

Echo... sound bouncing against object... backwards in the spaces between... expanding outwards multiples infinitely... inward... four... changes... two captured by the skin of reality... pressures inside... pressures outside... MAGNIFIED.

ILLUSTRATION: S-34

EYES + EARS = IDEAS

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I CHING

I ching... one... water becomes six... metal two... earth becomes seven... metal three... wood becomes eight... earth four... wood becomes nine... fire. Sequence is... green to red, to blue, to lemon yellow, to orange yellow, to purple, to orange... Fa... Do... Sol... Mi... Mi flat... La... Ti... Re.

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OTHER SIDE OF ART

BY BARBARA HERO

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Page #: 5 - 1

EYES + EARS = IDEAS



EXPANSION-CONTRACTION (Faster the speed - smaller the circle).

When equilateral triangles are drawn (sides equalling the vertical segment in the circle), and a series of circles divided by half the previous circle are constructed the natural limits of this progression ends at the fifth circle. If time values are given to these circles, as well as tone value, the time value becomes a whole tone for the first circle, succeeded by ¹/₂, ¹/₄, ¹/₈, ¹/₁₆, ¹/₃₂,... a reasonable limit.

Page #: 5 - 2

EYES + EARS = IDEAS



SHOWING HOW "256/243" EQUALS THE LIMIT OF A CYCLE

256 represents a multiple inherent in the relative pitch of both D plus and D^b (E^b or C[#]). By making orbits at each multiple on an angled square the patterns are formed. In this case the numbered axis extends far beyond the limits of the canvas. Each point is ¼ of an inch apart, and extends to 90 points. Horizontally the number extends to 125... a ratio of hypontenuse to side of 125:90. At 125 the angle projects to right angles to form the other side of the square. The numbers then increase by 10 to 350 points. The orbits then reverse as if sound had hit an object and rebounded. The orbits are seen to fall in spaces between the orbits in contrary direction. The limit of 125 represents a cluster of tones which could be played as a chord.

EYES + EARS = IDEAS



ANOTHER TYPE OF NUMBERED GRID

A square grid was numbered 1 to 81 (the limit). The numbers then begin again, until they reach another limit. The tones were placed at each appropriate number. At the end of the cycle $E^{#}$ (F^{b}) the compass was placed to indicate the beginning of cycle #2. The orbits then interlock. The broken lines with arrows point to the sequence of development of each tone.

UNIVERSAL LADDER OF SOUNDS ON A WAVE FORM

The first square in the upper left hand corner depicts the tones as they might appear on a wave form. The first half of the square is filled with notes. The second half is empty space.

The numbers represent the first 16 units of measurement. (i.e. the square is divided into sixteen units along a vertical and horizontal axis.)

The second square represents the numbers 60 to 90. The upper halves of each square are concerned with a circle of fifths progression.

The lower portions (cut by the diagonal) represent double fifths, which appear to be an ascending diatonic scale. The colors around each square are associated instinctively with the circle of fifths. The lines within these squares represent the field of double fifths.

The green area denotes F[#] consists of only one note A in a key or field of F. This is ordinarily found as the end of our series of fifths.

All the squares encompass a certain limit of frequencies of relative pitch.





TONES ADAPTED TO A DOUBLE HELIX

The tones were placed on either hexagons or pentagons depending on whether their ratios involved 6 or 5. In this case the hexagon appears to be constructed from a circle with curved radii of the same spin, outward. The pentagon appears to be constructed from five equal points around a circle with the curved radii in reverse spin, folding inward.

The double helix encloses these increasingly large polygons.

Page #: 5 - 6

EYES + EARS = IDEAS
THE MULTIPLICATION TABLE AS A FRAMEWORK FOR THE RATIOS OF RELATIVE PITCH

A multiplication table of 1 to 20 was laid out on a grid. Wherever the numerator and denominator were located, a circle was drawn. Numbers which were cubes (indicated as cubes) show a pattern which I refer to as a "visible three dimensional world". Square numbers always form squares along a diagonal. These form square boundaries for the series. Each series was chosen from that derived by Alain Danielou, based on a circle of fifths, beginning with a base series of C natural.



ILLUSTRATION: B-5, B-6, B-7 & B-8

EYES + EARS = IDEAS



CLUSTER OF RINGS AT CENTER EQUALS EXPANSION (Cluster of rings at rim equals contraction).

This drawing shows how the rings from diminishing triangles fall in the spaces between one another Since the hypotenuse can be assumed to extend faster than the side, the rate of speed would appear to be greater in the divisions along the hypotenuse. Therefore each ring would revolve at a different rate of speed. Also one side would revolve in a counter-clockwise direction to the other side. When one positions the actual ratios of the notes, by doubling on one side and tripling on the other side, the angles appear to be in conjunction with the trianglular divisions until the limit at 256/243 where the angles of the slant

trianglular divisions. Perhaps this is another reason for the limit to occur...

becomes greater than a natural

IS... AN EXPANSION CONCAVE... OR CONVEX?

Six circles were drawn tangent to the center point of one circle. Each arm of one circle becomes a curved axis, representing different multiples.

From this we can determine the patterns of the different spacing between the multiples. Each number represents either the numerator or the denominator of a pitch relative to its fundamental. An expanding axis is to be considered one which has the notes pulsed widely apart. We took the rim of the first circle to be 100. Therefore the circular red lines are notations of 10s. The appropriate notes are indicated along each axis. We conceived the concave and convex areas to be next to one another. The curved axis was chosen as it seems to my way of thinking to be more in harmony with universal laws... If one thinks of a balloon being inflated. IS AN EXPANSION CONCAVE? OR

CONVEX? ...



ILLUSTRATION: B-10

EYES + EARS = IDEAS



THE MISSING HARMONIC OF NATURE THE PENTAGON

If we draw five circles tangent to a central point, and then with C as a middle note, we can mark off a scale on six arms. One arm is always the inverse of the other. Think of the inside rotating clock-wise, the outside rotating counter-clock-wise. Each scale could be on a multilevel keyboard. The clock-wise inner portion contracts inward... whereas the counter-clock-wise outer portion expands outward...

A NEW KEYBOARD INSTRUMENT

If we think of all the red arms rotating in one direction and all the blue arms rotating in the other direction, we might see how one expands and the other might $\mathbf{A} - \mathbf{E}$ contract...

Each arm represents not only a direction of motion but a multiple, an expanding, contracting, concave, convex, inside and for outside.

We take 180 degrees as the limit of velocity... within this limit all of the notes with simple ratios fit into this relation of angle to polygon and are placed at the appropriate points.

We can see a pattern emerging of notes of a scale from F, F, A, to B, which can be played on an instrument. The piano-like keys are a design for a curved piano.



ILLUSTRATION: B-12

EYES + EARS = IDEAS



MULTIPLES ON CURVED AXIS

Within a curved space of 180 degrees, notes are placed. The cluster of notes ending at 9 degrees (G) represents a multiple of two and relates to the first octave of the simplest ratio of each note to C. The next, ending at 45 degrees, is a multiple of 9 and includes those notes which are multiples of 9. The motion of the whole is found to be retrograde, and also appears to be contracting and accelerating. The score shows how the pattern would sound.

The density of the chord-like notes indicate that there is more than one note on each multiple in many cases...

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MULTIPLES OF TWO, THREE, FIVE, SIXTEEN, EIGHTEEN FORM SOLID CUBES.

Each cube represents a cluster of notes with cube roots in either the numerator or the denominator.

The motion of three of the arms is considered to be clockwise, and three of the arms counter-clockwise. Since the spaces between these arms made out of perfectly intersecting circles is devoid of any of the ratios used in music, we can assume that the visible world occurs only at the cube roots of multiples of 2, 3, 5, 16 & 18.

Since there is a large area representing 120 degrees, we can also assume that there is a missing vibration, or two sections of void.

Each arm falls within a sixty degree section.

The starfish form, the hand and the man, all indicate the 60 and 120 degree spacing. The invisible, immaterial world is the one fixed by immutable laws which the relative pitches of music reveal...





UNITS OF MEASUREMENT FOR EACH RELATIVE PITCH BASED ON THE HYPOTENUSE AND THE SIDES OF DIMINISHING TRIANGLES.

cube root is at 27, we place the first cluster of notes with 27 as a ratio in the shortest arm, in within a core... a counter-clockwise motion. The subsequent cubes become longer forming a spiral (arrows). At 125, determined to be the rim of the circle, the direction changes. The next arm almost completes the circle back to the rim and the following cube root is found with a complete circle and over back to the rim. Between these five steps or sequences the numbers 144 representing the note D, and 216 representing the note B are located near the rim. One arm is a multiple of 16, the other of 18. 144 is the mystical number of ancient Chinese philosophy denoting the receptive. 216 is the number for the creative. Together these numbers add up to 360, days of a year, or degrees of a circle. Therefore we might say that the world is created after six changes.

The middle section is a detail of the aforementioned world. When the numbers at either side are taken as actual measurements, and plotted from one side to the other to form

The drawing on the left shows the sequence of growth of each scale or mode. Since the first ratios used in the first octave of a musical scale, the notes, with the exception of B, all fall

To the right, each note is represented as if it were actually measured in its proportion musically of relative pitch.

When we take each note with one unit as a measurement, we find that the scale will fit into a series of sides and hypotenuses of smaller and smaller triangles, as if each unit were divided by halves (side or hypotenuse).

C therefore is always two sides, C' one side, F is always the hypotenuse as the ratio of the hypotenuse to the side is roughly 4/3.

When a circle is drawn at the point of the triangle, representing the hypotenuse as a multiple of 3, and the side as a multiple of 2, we find that the spiral cords fit in the spaces between each other ...

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EYES + EARS = IDEAS

A SYNTHESIS OF SERIES IN THE FIRST OCTAVE COMBINING THE GRID AND WAVE DIVISIONS...

The notes of the first octave up to 15/16 fall in familiar patterns. The orbits were formed by using two center points, one at C, one at E.

The one at E was formed to conform to the curve already established by the wave form (dividing by halves).

At G and a missing note (6/7 doesn't exist in a musical proportion) a circle is evident. Since G stands for earth in our system, within its orbit are found Mercury, Jupiter, Mars and the asteroid zone.

Arrows pointing outwards represent an expanding force, while arrows pointing inward signify contracting forces. The number on the circular forms indicate an attempt to work out a number system on a curve....





THE FIRST CYCLE MIGHT END IN A DISINTEGRATION.

The first or base cycle is shown visually and musically in the detail to the right. Where a note's ratio to C is indicated a line representing the color assigned to the note is drawn. A series of zig zags take form. The red tubes representing the sixth dimension of space stand for the side of a triangle. The green tubes are always the hypotenuse of a triangle. Since the proportions of F to C are in the relation to one another as 1:1 is to 3:4, as is clearly seen, the hypotenuse is always extending at a faster rate, and of greater length than the side.

Musically this can be heard by sounding the C and the F frequently. The relative proportions of the other notes are indicated as unit measurements. Their actual proportions would be the inverse of what is shown, but it makes it easier to understand when reduced to units of one.

The reason the cycle ends at 64 as the side of the triangle and at 243 as the hypotenuse, is that the limit of 243 and 256 appears to be limited in terms of finding a ratio 729/n. The nearest ratio is 729/640. 100×64 indicates that another measuring rod must be used at this stage.

In the base unit, the measuring rod is 2 on the side ---- 3 on the hypotenuse... The drawing on the left shows how both series plus and minus (sharped or flatted) overlap on series 1, adding a visual confusion. The grid shows how one can determine a unit measurement, by extending a line to its multiple, thus determining length proportionally and angle.

At the point where angles cross, one can establish a beginning place for another series.

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MULTIPLES OF TWO AND FIVE AND THREE AND FIVE ...

The segment of 60 degrees at the upper right hand corner shows the patterns of multiples of 2 and 3. The upper right segment shows the pattern formed by linking the musical ratio numbers to axis of 2 to the left and five to the right. The middle right axis gives the pattern for a multiple of 5 with an extension of the multiple of 2. This pattern gives a very perspective-like effect.

The multiples ended at 512 because there was no room on the canvas to carry it further, but we can assume it takes the same pattern. This whole encompasses over 40 of the 53 notes on a sound ladder. Each line represents a note according to its color, and is so marked. The melodic line of each of the two multiples of 5 with 2 or 3 is indicated to the right. The upper and lower points of each line fall in the spaces between...

ILLUSTRATION: B-18

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THE INVISIBLE VIBRATION WORLD ...

The ratios (colored bars) of each note to C was drawn from a central point as though traveling along a vibrating string.

Two curved segments rotate clockwise and counter-clockwise. They appear as ribbons twisting inside out. The ball shapes represent cube roots.

The multiples used were only 2, 3 & 5.

An axis was found to exist with all combinations but one. There was no (5×5) 3 to be found when dealing with music intervals. From this we might assume a cycle of beginning and end...

The numbers 144 and 216 were found along the same axis in this drawing, representing the receptive and the creative ancient Chinese philosophy...

ILLUSTRATION: B-20

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EXPANDING... CONTRACTING (In the field of <u>C</u>).

The grid used was a circular rather than a right angled grid. The tones, then took on different patterns. Since the principle of the wave forms constructed is that one side always contracts, while the other always expands, the patterns of the tones becomes very different in both cases... One is the inversion of the other in expansion-contraction, convex-concave, direction of number sequence, inside and

outside, solid and space.



ILLUSTRATION: B-22

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UNIVERSAL LADDER OF SOUND (Multiples of 2 on one side... 3 on the other)...

This drawing illustrates the principal of the tones used in relative pitch being located on what may be called a harmonic diagonal.

Since each note is made up of a multiple of either two or three, the contracting side would be the lesser 2, and the expanding would be the 3...

Therefore triangles were constructed having one side a multiple of two and the other side a multiple of three. The notes marked by the small colored lines on each module, then were found to be divided roughly into an octave on each module. (Seven notes).

Starting with C, each module becomes a circle of fifths (every fifth note on the diatonic scale).

These are called the field of C, the field of G, etc. In this model only five of the fields are shown. The score for each module is written above, starting with the largest module, the field of B...

I CHING PRIMAL ARRANGEMENT

Each of these modules symbolizes a unit measurement from one to nine. Since the number five represents the earth in the middle of all the numbers, and man, it is left out. Each unit extends in only one direction as a line. Even numbers represent heaven, odd numbers represent earth...

"Water in the north has sprung from one of heaven, which is complemented by the six of earth. Fire in the south has sprung from the two of earth, which is complemented by the seven of heaven. Wood in the east has sprung from the three of heaven, which is complemented by the eight of earth. Metal in the west has sprung from the four of earth, which is complemented by nine of heaven. Earth in the middle... has sprung from the five of heaven, which is complemented by the ten of earth."

FROM THE I CHING ...

The numbers are joined to one another according to the above description from the I Ching...



ILLUSTRATION: B-24

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EXPANDING DIMINISHED ASCENDING SCALE CONTRACTING INCREASING DESCENDING SCALE...

This drawing portrays three different aspects of relative pitch. The long bar at the bottom shows the clusters of notes (arcs) at a point close to the left end of the module. These were determined by laying out the relative pitches from C on a numbered grid. These tones form an ascending scale with a gap between D (orange) and C^b (red-black). These form mathematically expanding radii, which diminish, in terms of time. The other side (right) indicates the difference between an infinite series (left side) and a finite length. The given, or finite length was divided into increasingly smaller sections based solely on the relative pitch, using exactly the same fractions as before. The pattern literally reverses before one's eyes, as the clusters of tones are at different places. The vertical bar modules also reveal this division of tones, but now the division is by halves going toward the the center of the circle, or multiplying going outward from the circle. One way of determining the division by halves was to lay all the tones in whole numbers out on the I Ching Hexagram grid. When the middle of this grid was used as a center point, each note found its orbit in a certain sequence. The sequence was found to coincide with a sequence formed of measuring arcs of polygonal shapes representing relative pitch. The sequence was also found to coincide with what was an evolution and involution axis, which will not be discussed here ...

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THE FINITE WITHIN... THE INFINITE WITHOUT

The radius of a circle was taken to be the hypotenuse of a rectangle. Imaginary sides of the rectangle were drawn above and below the 60 degree angles. The angle is 60 degrees because it was found to accommodate the entire array of notes when laid out according to relative pitch on a fractional grid. (See chapter: Glimpses) When a line was drawn perpendicular to the hypotenuse from the upper corner of the square, a circle and a line were drawn. This was repeated on the other side and another perpendicular drawn to "G" from ½ of the line at 3. Then, outside of the circle forms were drawn wherever lines intersected. Since the lines were contained within the rectangle, it was called the finite. Since the lines were diverging outside, it was called the infinite.

ILLUSTRATION: B-26	EYES + EARS = IDEAS	Page #: 5 - 25



INVISIBLE WORLD ... MATERIAL WORLD

A circle was drawn and using the same radius was then made into six circles along the circumference of the original circle. The 60 degree angle is found to be one of the most useful in this study. Since 120 degrees has been the limit of arcs used, this angle was superimposed on an imaginary keyboard. Since on a keyboard five steps ascending is equivalent to four steps descending (G¹ to C'), we found that an octave and a half (G to D'') is comprised within this angle. Then by taking a circle of fifths from C to G to D (arrows), the field of A will correspond to the field of G" descending, etc. Descending fifths become C#, F#, B, E, A, D, G... Since we have assigned the 120 degree angle to the visible world, the rest of the circle is the invisible world ...

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EARS = IDEASEYES

TRIANGLES IN ORBIT

This drawing represents still another way of plotting the degrees of arc with a series of diminishing triangles representing the order of tones when laid out on a grid.

When a circle is divided by halves from the circumference, the diminishing triangles fit into the spaces.

One side of the circle represents space (the triangle). The other side represents time. Time fits within space and space fits within time...





THE REASON FOR THE REVERSE AXIS

To form a curved grid, two circles must be constructed. By numbering each orbit from its center point, it is easy to see .how the numbers must be reversed. An orbit is considered contracting when the numbers go in the reverse direction from the first.

An axis is considered contracting when after constructing a wave form by dividing by halves, the lines of the axis are bounded by a smaller circle and cross in a web.

THE FINITE NUMBERED GRID

In this instance the grid was constructed so as to agree with the proportional aspects of the fractions. To construct such a grid the fractions had to run on two coordinate axii. The spacing of the tones then takes on a relationship of increasingly small spaces between each successive tone reading from left to right upwards. Orbits were drawn from the ½ mark and the 1/1 mark to show the inversion of the two orbits. Each note was marked with its corresponding planet...



ILLUSTRATION: B-30

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MULTIPLES OF 2, 3, 5 AND 16 ...

125 is considered to be the limit of one circle.

The first tone which has either a numerator or a denominator of relative pitch of 27 is considered the first cube root in the sequence of cube roots. The next is 64, then 125, then 512 and 729. The tones which as polygons have their degree of arc determined are situated in the appropriate degrees. F plus-plus, as the limit of the circle at 90 degrees, is at 512. At eight degrees are located B-, D plus, E^b, D plus and F plus-plus. At 45 degrees are located F--, G plus plus, C plus plus, and B^b --. After this drawing a curved axis was used to determine the multiples...

ASCENDING ... DESCENDING

In this case a grid was constructed from a web with the orbits as solids. The series progresses from C, G, F, A, D to the limit of the web form. From that point the notes B (Contraction) and A (Void) continue in the empty space after leaving the web solid.





THE CHINESE MAGIC SQUARE

When the notes, having been determined from the chart of Hexagrams, are placed in the appropriate places in the magic square, they can then be divided into odd and even numbers. When they are multiplied by 2 and by 3, they form a zig zag shape, which when filled in by the webbed structure creates a three dimensional shape.

This three dimensional shape crosses at 5, the symbol for man. Since time symbolizes odd numbers and space symbolizes even numbers, man appears to be caught between the interaction of time with space.

Musically, we have determined from other problems, that space expands, and is an ascending force, while time contracts and descends.

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ILLUSTRATION: B-34

EYES + EARS = IDEAS



THE MEASUREMENT OF MANKIND

The separation of the senses... smell... hearing... sight... taste...touch is depicted on wave forms of music axis.

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LIMITS OF THE CYCLES... HIGHER MULTIPLES.

The limit, in this case is brought to 320, on the multiple of 10 axis.

Each placement of tone was determined by marking off each circle by tens until several revolutions around a single circle were established. The interlocking character of the webbed forms

appears a tangle of relationships.







GROWTH VIBRATIONS OF A BUTTERFLY

When circles are plotted in accordance with the circular markings of a butterfly's wings, the original circle enclosing the butterfly is extended to twice its size. This principal of doubling (or halving) is carried further in the central portion of the drawing. After five steps of halving, the final diameter is used as a unit measurement. Between the second and third rings are two units... between the third and fourth rings are three units... and between the fourth and fifth are seven units. The center portion looked at as a wave form shows the energy patterns of the butterfly wings at either end. The eyes on the axii indicate ascending +, or descending -, looking upward or downward.

THE EYE SENSE PERCEIVES THROUGH INVISIBLE FORCES TO REGISTER A MATERIAL OBJECT.

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THE PUZZLE OF 125

Certain identifying patterns emerge when each tone is marked along an axis according to its multiple (5, 3 or 2). When the axes become curved with the same spin, clothing them with a webbed structure makes the patterns even more evident. In this case four arms are cube roots, and occur at different spacings within the group of circles. A UNIT OF MEASUREMENT WAS A DIVISION OF ONE OF THE ARMS INTO TEN EQUAL UNITS. 125, A KEY POINT WHERE AN OCTAVE OF TONES RADIATES FROM ITS CENTER, IS FOUND AT THE RIM OF THE ORIGINAL CIRCLE.

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Barbara Hero. 'Tone F' of the series 'Fifths Depicted on Squares', acrylic paint on canvas, 24 × 24 in., 1973. (Fig. 6, cf. page 18.)

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EARS = IDEAS

VIII-1

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PAINTINGS BASED ON RELATIVE PITCH IN MUSIC

Barbara Hero*

Abstract The author's approach to pulning changed direction in 1961 when she begun formal studies of mossies. She adapted relative pitch as a measure for quantiturely differentiating musical longer represented in her pulnings. Specifically, the pitch of a tone was designated in terms of the ratio of its frequency to that of muldle C on a piano. She chase a scale with the aid of the Lambdona diagram of Pythongorout table. The values of the resulting relative pitches and their reciproceds were appropriate for the representation of tones by radii or by areas in her paintage. In addition, for each musical tones her has assigned a specific today, a designation that she generally keeps constant. All the paintages of this series are of a generative directer.

assigned a spectra cours, a assignment that the generative keeps constant. At the paintages of this series are of a generatical characteris. She calls attention to two interesting results that have a relationship to musical tones in a circle of fifths. For example, her assigned colors in a circle of fifth appear as a sequence of complementary color pairs. The planets assigned by G. Arnows to musical tones, when they are arranged in the order of uscending fifths, occur in a sequence corresponding to the positions of the planets from the Sim.

L

While I have often thought that an art work should not need to be explained to viewers, I now do feel that viewers should be told about its content and how it is presented, especially in the case of nontraditional kinds of art. Such analyses made by artists will generally be of benefit to themselves as well. In 1951, a catalogue introduction to an exhibition in which I participated stated that 'a reflection of the universe can be found in the very things we are inclined to overlook' [1]. Before 1961 I painted landscapes, based particularly on the reflections of buildings and bridges in water. They have a flat quality and the proportions I used were chosen arbitrarily without much regard for threedimensional representation. (One of these landscapes is reproduced in Ref. 2.) Then a change occurred in my approach when I began to study musical composition and musical acoustics.

At first I began to make paintings that show a combined influence of the appearance of water reflections of buildings and of notes on a music score (Fig. 1). I visualized, for example, the treble clef score as a mirror image of that of the base clef, with contrary emphasis, and I indicated chords and ascending or descending notes by linear configurations of dark and light areas. In 1970, while looking at the score "Treatise" by the English composer Cornelius Cardew, I was struck by a similarity in

 Artist living at 48 Lawrence Street, Boston, MA 02116, U.S.A. (Received 14 May 1973.) visual appearance of some of his score to paintings in my W.R.S. Series'. I decided to work towards a goal of making paintings in which musical tones would be represented by radii or areas and by colors.

Subri recently described in *Leonardo* his paintings related to elemental constituents of matter, where choices of colors were made on the basis of prominent atomic spectral lines and the corresponding area given each color was proportional to the energy associated with its wavelength and frequency [3]. The forms that he used in representing individual elements were chosen arbitrarily.

My approach was also to employ physics as a basis but in my case 1 restricted the domain to that of sound. The air close to a vibrating source (such as a violin string) is set into vibration, giving rise



Fig. 1. 'W.R.S. No. 5', acrylic on canvas, 36 + 48 in., 1961.

EYES + EARS = IDEAS

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to a train of pressure waves (i.e. sound waves) that spread in air in sphere-like ripples rather like twodimensional ripples on a pool of water [4]. Sound waves are designated quantitatively by wave-length or, more commonly, by frequency. The pitch of a musical tone is an acoustical property determined by the frequency. Thus a tone of high pitch is one of high frequency.

My approach is based specifically on the relative pltch of tones, or, as will become evident below, on the reciprocal of the relative pitch. The relative pitch of a tone is determined by its position in a scale. It is the ratio of its frequency to that of another tone taken as a basis in the diatonic major scale. The frequency ratio associated with a chosen musical interval is independent of the actual frequencies of the tones. Thus, although the frequency of the current international pitch standard has varied during the past (i.e. the tone a' (la) in the octave of c' (middle C) (do) has been assigned frequencies between 400 and 440) and the frequencies of the other tones in the scale have varied accordingly, the relative pitch for each tone is constant in the diatonic scale. It is the constancy of the numerical ratios that led Pythagoras and his followers to seek analogies between these ratios and the distances of celestial bodies from a central point [4]. In my work I have chosen as a basis c' (do), although another tone such as f' (fa) might also have been a good choice (cf. Table I). Thus, for example, the relative pitch of e' (mi) is the frequency of e' (330) divided by the frequency of c' (264), to give 330/264, or 5/4, and its reciprocal relative pitch is, then, 4/5. Similarly, the relative pitch of C above middle C, i.e. c", is 528/264, or 2/1, and its reciprocal relative pitch is 1/2.

I should digress here to explain my nomenclature. I use lower case letters throughout for representing specific tones. Apostrophes and subscripts are used to indicate octave ranges. Middle C is given by c'; and C in the octaves above is given correspondingly by c", c", c", . . .; C below middle C is given by c (without an apostrophe or subscript) and C in the octaves below are indicated correspondingly by subscripts, c, c, c, c, ... Thus the tones for C are represented in a sequence of increasing pitch by . . . c,.., c,. c, c, c', c'', c''', . . . Within an octave, for example, c" to c", the other tones are labeled correspondingly by, e.g. e", f", g"; or between c and c', they would be c, f, g; or between c, and c, they would be e,, f,, g.. A plus (+) or minus (-) superscript indicates that the tone is raised or lowered by a difference of pitch of about one-quarter of a semitone, for example, a" [5, 6, 7]. I use capital letters to denote tones without regard to specific octaves.

I assigned specific colors to selected tones within an octave for their identification in my paintings

Barbara Hero

(these colors are the same for any octave), for example, red, orange, yellow, green, green-blue, blue (or violet) and black (or purple) (cf. Table II). I chose the same colors for the spectrum for tones as did Pythagoras and, centuries later, Newton [8], but I made my choices only after I had realized that these assigned colors would correctly assume the positions of complementary colors on the cycle of perfect fifths, which I discuss below.

I employ the relative pitch of a tone in a quantitative way in my paintings. For example, for the P(fa) (relative pitch 4/3) and d' (re) (relative pitch 9/8), I use the fractions 4/3 and 9/8 (or their reciprocals 3/4 and 8/9) in determining the positions of the shapes representing f' and d', respectively. I do not often use a complete dodecaphonic scale, i.e. one made up of 12 halfones (semitones), because the relative pitch of its tones, for example, g', does not match that of g' in the composite scale that I use [9].

I derived the musical scale that I generally use from the Lambdoma (or Pythagorean table), which dates back to the ancient Greeks [6]. The Lambdoma is a square array of points having fractions systematically assigned to the points. It can be visualized very easily with the use of a sheet of paper lined with square grids or, better yet, a sheet of ordinary graph paper. The x-axis and y-axis are drawn and the coordinate points along the axes are numbered by integers, $x = 0, 1, 2 \dots$ and $y = 0, 1, 2 \dots$ (Fig. 2).

The coordinates (\bar{x}, y) of any point falling on an intersection in the grid are interpreted as the numerator y and denominator x of the fraction y/x. Thus, the coordinates of point A(x, y) are given by (3, 8) and the corresponding fraction would be 8/3. If the point A were labeled 8/3 and all other grid intersections were labeled in the same



Fig. 2. Lambdoma diagram.

Paintings Based on Relative Pitch in Music

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8	black	Saturn	56 (57)
ħ	red-	Saturn	
â	purple	Unknown planet	8
<	blue- violet,	Asteroids	64 (63)
**	blue	Asteroids	
-14	green-	Pluto	68 (69)
0	green-	Earth	- (36)
Ľ.	green	Uranus	76 (75)
L.	50	Mercury	81 (80)
щ	yellow- omage	Jupiter	4
÷.	yellow- orange	Unknown planet	\$\$
A	orange	Mars	8
Å	red-	Mars	
ŧ.	scarlet	Neptune	51
U	E	Venus	2
Tone	Assigned olors	Assigned planets [12]	Assigned whole Numbers [12]

15

16

way, then Fig. 2 would take on the usual appearance of a Lambdoma grid. Here the fraction y/xis taken to represent the reciprocal of the relative pitch and hence the point A (3, 8) corresponds to the tone g_{i1} (8/3).

It should be pointed out that g_{ii} is not uniquely represented by point A. Point B, which is given by (6, 16) also corresponds to g_{ii} , because the fraction 16/6 reduces to 8/3. Similarly, all the intersections along what I call the harmony diagonal (1, 1), (2, 2), (3, 3) etc., represent the tone c', given by the reciprocal relative pitch 1/1 (cf. Table 1), since all the fractions, 2/2, 3/3, 4/4, ... reduce to 1/1. Since the x-axis and the y-axis both extend to infinity, such repetition occurs without limit along all rays emanating from the origin.

The scale that I generally use, for which the octave is c' to c", is associated with the dashed line parallel to the harmony diagonal (Fig. 2). The dashed line actually passes through points corresponding to the tones c" (1/2), g' (2/3), f' (3/4), e' (4/5), e** (5/6), d' (8/9) and d*- (9/10). The tones of the scale that are not on the line are a' (3/5), a** (5/8) and b** (5/9). I shall describe later how I use these fractions in designing my compositions. It is sufficient here to mention that I prefer to work with fractions between 1/2 and 1/1. If I had drawn my dashed line farther below the harmony diagonal, then smaller fractions would have been introduced. If the dashed line were located above the harmony diagonal, then fractions greater than 1/1 would be introduced. If the dashed line were not parallel with the harmony diagram, then fractions less than 1/2 and/or greater than 1/1 would tend to be introduced. Of course, a ray could not be used, because it represents just one tone.

While the color I use for a tone does not generally change from one picture to another, the geometrical shapes that I choose conform quantitatively in design, size and arrangement with the corresponding values of the relative pitch. I have found Alain Danielou's book Semantique musicale [9] a useful source for suitable geometric shapes. Moreover, his tables and diagrams of 53 musical tones within the octave, indicating the pitch of each tone relative to that of c' in scales based on fifths and thirds, was particularly helpful to me. These scales with their relative pitches include not only the diatonic scale but also tones that are slightly sharped or flatted (indicated by one, two or three plus or minus marke).

The idea of relating colors to musical tones is not new; it intrigued Aristotle and Newton. Numerous artists have proposed correspondences between painting and music [e.g. 10, 11]. Rothachild discussed the application of her color-music analogy in her paintings in *Leonardo* [10]. My

EYES + EARS = IDEAS

Barbara Hero

paintings are not based upon musical compositions (although some were read as scores by Adam Hubble, a flutist, and played while on exhibition in October, 1973, at the Max Protetch Gallery, Washington, D.C., U.S.A.) but they are based on patterns, structures and sequences of tones. The representations of tones are based in a quantitative way on their relative pitch.

II.

The first way in which I expressed the tones of a scale involved the following construction. I made a series of concentric circles, or orbits, to represent individual tones. The radius of each orbit was proportional to the reciprocal relative pitch of the tone. My idea of using a circle to represent a tone came from the analogy of a train of sound waves of a single tone in air to the train of surface ripples that is produced when a pebble is dropped into a quiescent pool of water. Since the wavelength is inversely proportional to frequency, the reciprocal of the frequency is a measure of wavelength. In this analogy and in others I discuss later it seemed appropriate to represent tones by wavelengths or, in fractional notation, by relative wavelengths (i.e. reciprocal relative pitch).

I drew the circles using a thin string as a radius. The full length R of the string for the major diatonic scale (key of C major) represented the radius for the circular orbit of c¹. Since the reciprocal relative pitch for c¹ is 1/1 and that for c¹⁰ at one octave higher is 1/2, I made the radius of the circular orbit for c¹¹ half as long as the radius of the circular orbit for c¹¹ half as long as the radius for c¹ by simply knotting the string at its center. Rather than fokling a string over to divide it into thirds, fourths, fifths, etc., I found it easier to measure the radii directly from a large Lambdoma diagram. If, for example, the full length of the string R (cf.



Fig. 3. "Isoceles Trapezium", acrylic on canvas, wall space 78 × 78 in., 1973.

Paintings Based on Relative Pitch in Music

Fig. 2) is located such that it fits vertically between the harmonic diagonal and the x-axis, then the rays corresponding to the tones in question will intersect the string at the other radial distances, as measured up from the x-axis. An accurate way to determine the radius for a tone is to multiply the length of the string R by the reciprocal relative pitch.

I have used concentric circles to represent musical scales. When the radii were particularly large, I made circular arcs on separate canvases (which I shall refer to as 'panels' or 'modules') that must be hung in a specific way (Fig. 3). The small triangular shape in Fig. 3 is colored yellow for e' (relative pitch 5/4) (Table II) and its arc represents the circular orbit. To the left of the triangle is a trapezoidal panel in green, showing an arc for f' (4/3) and another one in violet for a15 (or b1) (16/9). To the right of the triangle is a small panel (vellow orange) that represents e"+ (or d'8) (6/5), followed respectively by panels for g' (3/2), blue; b' (15/8), black and do+ (16/15), orange. The five largest trapezoidal canvases can be fitted together to form one trapezoid. All canvases are portions of a triangle having an apex angle of 60°. I chose the angle of 60° after learning that tones of interest in music tend to be represented by points on the Lambdoma diagram in the area between two rays located at 30° to each side of the harmony diagonal (Fig. 2). If one examines the values for the reciprocal relative pitch for the tones, one sees that they progress in the following order: 2/3, 3/4, 4/5 and 5/6 as the scale descends. This I regard as a contracting influence. On the other hand, the following order obtains as the remainder of the scale ascends: 8/15, 9/16, 15/16, an expanding influence. Such expansions and contractions are used in many ways by musical composers to express, for example, growth and decay, and rising and falling.

In making the series shown in Fig. 4, 1 adopted the idea of expansion and contraction in another way. Tones are represented by dotted circular orbits whose radii are proportional to reciprocal pitch. The squares presented horizontally increase from the left progressively in linear dimension by one unit. The squares represent reciprocal relative pitches: 1/1, 1/2, 2/3, 3/4 Since the tone represented by 6/7 (an unpleasant flatted e', or a sharped a') is not customarily used. I represent it by a white square. The eighth square was made to represent the harmonic series by a series of progressively smaller and smaller triangular arrangements of squares. The 8 × 8 grid pattern contains 64 squares and, in accordance with the wholenumber scheme in Table II, I assigned to tone a' the entire field of 64 squares. The biggest triangular array contains 28 squares, followed by 16, 10, 6, 3 and 1, representing the denominator of the reciprocal relative pitch for the b" (9/16), d'- (9/10), e"+ (5/6), g' (2/3) and c' (1/1) respectively. I could have chosen a1+ (27/16) or d+ (15/16) for the

17

section of 16 squares. I assigned the dimension of time to the vertical axis at the left. I connected the upper left corner of each square to odd numbers on the axis, forming the zigzag line, which to me suggests the contraction sensations of tones represented by the first six squares and the expansion by the squares beyond the seventh. The large tilted square symbolizes the importance of the diagonal (Fig. 2).

• Ш.

I found it interesting to consider the tones of the major diatonic scale (represented by circular orbits) in relation to the orbits of the planets of the solar system after reading Georges Arnoux's [12] and Albert Roustit's [13] speculative books on the



Fig. 4. 'Progression by Squares', acrylic on canvas, 76 × 36 in., 1971.

subject. McClain's article is a recent pertinent reference [14]. The assignments of planets to notes by Arnoux are given in Table II.

If one considers the positions of the planets from the Sun, one finds that the ratios of distances of successive plants are in simple fractions corresponding to some of those of relative pitch, e.g. Saturn is 1/2 the distance of Uranus, and Venus is 2/3 that of the Earth. If tones are considered in a circle of fifths, starting with f' (Mercury) [12], then the corresponding list of planets will occur in the order of positions from the Sun (i.e. Mercury, f'; Venus, c"; Earth, g'; Mars, d"; asteroids, a"; Jupiter, e"+; Saturn, b"+). The painting 'Circle of Fifths' (Fig. 5) was based on this idea. The construction of its design started with a circular band in which the fifths c', g', d', a'+, e'+ are indicated on the right. The assigned colors (cf. Table II) are C, red; D, orange; E, yellow; F, green; G, green-blue; A, violet. On the left side they are B, purple, substituted for black; F\$, dark green; C^{\$}, scarlet; G^{\$}, green-blue. When this color scale is examined with respect to a sequence of fifths (i.e. f', c', g', d'', a"+, c""+, b++, f", c"1 (d"), gut (am+)), one finds that the complementary colors appear in pairs in the sequence: red, blue; orange, violet; yellow, purple; dark green, dark red; green-blue, scarlet. Thus, since the circle of fifths may be regarded as a sequence of harmonious tones, I find it an interesting paradox that the colors are arranged in a sequence of complementary colors or opposites. This is typical of the kinds of analogies that can be found in apparently unconnected areas of knowledge. Such an unexpected correlation intrigues me and has spurred me to look further.

The radii of the circular arcs to the left of the center are different from those on the right in order to give the impression of a spiral that turns inward in a clockwise direction. The circle of fifths in music has traditionally been based on a spiral concept, because when f¹ is reached at every seventh step, the pitch of f"# and g", which on a piano would sound the same, are slightly different. The flatted tones form a spiral going inwards on an inner band to the right of center with the fifth a"+ being pale grey; e"+, pale blue; and b"+, very light grey. I call the white portion on the hourglass shape an 'anticircle' because it cuts the concentric circles. (Perhaps more descriptive than a spiral would be the form of a triangle developed by Victoria Glaser [15] for representing ascending and descending series of fifths.)

The note f' for the planet Mercury was placed at the center, on the 'anticircle', since it is the first tone in my 'Circle of Fifths' and Mercury is the first planet from the Sun. In the upper left-hand corner of the painting, I have inserted four of the

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remaining tones from this circle of fifths; d", rust; g'" (f"), dark grey-blue-green; d"" (e"), yellow grey-green and a"s (e"+), grey-violet. The series of concentric circles drawn immediately below the center of the 'anticircle' represents the orbits of the 14 fifths: f', c", g', d", a'+, c"+, b++, f"\$, c"\$ (dio), gut (au+), dus (eu+), aus (bus+) and eus (f"+). It is important to mention that double fifths (a double fifth means skipping a fifth) place the tones in the following ascending order: f', g', a'*, bi+, cu\$ (du), du\$ (eu+), eu\$ (fu+), (fu), where after seven tones (seven planets) the cycle begins again. Descending single fifths place the second tine at b"+, the order reading: e"+, a"+, d", g", b"+, e'+, a'+, d', g', c', f', or descending double fifths: f"+, e"+, d", b+, a+, g', f', another example of expanding and contracting that can be expressed visually in a spiral form.

IV.

I have used also the whole numbers assigned by Arnoux to musical tones [12]. For example, Fig. 6 (cf. color plate) represents the tone F, Arnoux's set of numbers has an upper limit of 81, representing the tone F (Table 11). According to Arnoux, the reasons for using 81 as the base number for F are many. For example, 81 is the base number of an ancient Chinese musical system (Fa-La). It is also the last number in the Pythagorean series of triples. The ratio 81/64 measures



Fig. 5. "Lircle of Fijins", acrysic on convert, 4K × 36 In., 1971.
the Pythagorean third and 81/80 expresses the difference in relative pitch between E^{\$} and F. He also pointed out the relationship between the Pythagorean musical scale and the fabled 'music of the spheres'.

In making the painting for the tone F. I proceeded as follows: I multiplied 81 (for F) by 2/3, getting 54 (which represents C) and I then continued by multiplying 54 by 4/3, getting 72 (which represents G). Alternative multiplications by 2/3 and 4/3 yielded 48 (D) and 64 (A). Taking 64 in place of 63, I continued, obtaining 42 (E) and finally 56(B). A descending sequence resulted (81, 54, 72, 48, 64, 42, 56) and it corresponds to a cycle of fifths.

First, I painted the entire ground green (24×24) in. panel), the color assigned to the tone F. Second, 1 marked off 81 spaces, 1/4 inch apart, on its right vertical side (y-axis) and 81 spaces along the bottom (x-axis) numbering from right to left. Third, I counted off 54 spaces along the bottom side (x-axis) to locate the coordinates (x, y) of the tone C (54, 0) and I made a red vertical line at this location. Fourth, I drew a web-like system of lines by connecting 1 on the x-axis to 81 on the y-axis; 2 to 80; 3 to 79; and so on until, finally, 81 to 1, I repeated the same web construction of lines connecting points on the y-axis at the right with points along the top from coordinate (64, 81) to (36, 81).

I then plotted small circles (difficult to see in the reproduction, Fig. 6) to represent the musical tones f^{1\$+} (relative pitch 64/45), f^{1\$++} (36/25), f¹⁺ (27/20), f¹³ (45/32), and f¹⁺⁻ (25/18) [16]. The circle for f1+, for example, falls on the intersection of the line ascending from the x-axis at x = 20 with the line descending from the y-axis at y = 27. The white chevron-like area in the painting marks the region where points representing tones are not generally used in music would fall. For example, the numbers 7, 11, 13 and 14 do not occur in the ratios representing relative pitch for the tones in Danielou's cycle of fifths and thirds [16]. The picture for F, being based on the number 81, can be used to plot points for all the other tones in the octave; other paintings that I have made for A, C, D, E and G, which are based on numbers below 81, cannot. The white grid of 16 squares (4×4) near the center of the painting for F represents f

(reciprocal relative pitch, 3/4); it appears also in 'Progression by Squares' (Fig. 4).

In conclusion, I wish to say that this project has been a most stimulating one for me. Being an artist and not a musician led me to try to depict the mathematical aspects of musical scales in paintings. Since an initial idea seemed to lead reasonably to another, it was as if I had tapped a rich vein of interrelationships between aspects of musical scales and visual art. I have used only a few of the many ways musical scales might be approached. I hope that what I have done will stimulate other artists to apply the ratios for the relative pitches of muscial tones. Since these ratios appear to be particularly significant for human aural experience, they may also be so for visual experience.

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SPHERES OF SOUND (Sequence of wave vibrations on the harmonic diagonal)

The tone C is the whole, a ratio of 1:1, therefore C encloses the total space. The tone G*, a ratio of 2:3 or $1\frac{1}{2}$ in inverse, falls next in the sequence, so becomes $\frac{1}{2}$ of C. Subsequent tones of F, 3:4; A, 3:8; E, 5:6; B, 9:16; D, 8:9, all become $\frac{1}{2}$ of the previous tone and form comma-like wave motions when drawn, so that an extended line does not twist when it meets the diagonal. It is thus easy to see an expansion or contraction. An expansion goes away from the diagonal, while a contraction moves toward a diagonal. By reducing the scale, the whole takes on the familiar form of the PROGRESSION BY SQUARES, and is likened to a falling body.

* Note: For the drawings the ratios are in wavelengths. Some of the wavelengths are in inverse relationship to the frequencies of the notes. Therefore 2:3 in frequencies in music is an F, while 2:3 is a G in wavelength.





LIMITS OF THE CYCLES OR LIMITS OF EXPANSION

The arms were radii of larger circles... which become circumferences of smaller circles. The direction in this case was in contrary motion. The wave form was extended to see if there was some relationship of the wave forms to the webbed areas.

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THE BEGINNING OF THE PENTAGON OR A SQUARING OF THE CIRCLE

This drawing indicates the possibility of a side of a square equaling C, as 1, $\frac{1}{2}$, & 2. In that case, the hypotenuse would be $\frac{3}{4}$, the length of the side doubled, and would therefore represent F. If the hypotenuse is divided equally into two sections, one section would equal G or $\frac{3}{4}$ the side, E would be the section, or fold, skipping a step, at $\frac{1}{2}$. A dr B would be the final fold at $\frac{1}{4}$. Note that the hypotenuse doubles as the side triples. The configurations are portrayed of each tone in its relative pitch to C. Multiples of 5×5 and 2×3 and 3×5 and 2×2 were then added to the spiral arms. The ratio of 125/256 is shown as a horizontal bar which suggests an increase of size of the original hexagon... or... a squaring of the circle...





A VISUAL COMPARISON OF RELATIVE PITCH AND PLANETS IN THE SOLAR SYSTEM BOTH MEASURED ON A SCALE OF 360.

360 is a convenient measurement of both planets' distance from the sun, and fractional measurements of an octave of tones according to their relative pitches from a beginning tone.

The radius of the circle indicates the planets from Mercury to Jupiter on the right. Comparing this with a division of a string of tones, left, certain things become evident. First, a measurement of 1/2 the string length measures the asteroid zone. On the left, one half of the string is void of tones, as the fractions are counted from only one half. It seems that one side can be an ascending scale of fractions, while the other seems to be a descending scale. Since we might assume that an ascending scale would represent expansion (rather than contraction), and a descending scale contractions (rather than expansion), there is a half way point which is obviously a change of dimension - or a change of scale.

In the planetary system this appears obvious, with the planets closest to the sun being smaller in size and orbit. The planets seem to be reversed and magnified from the Asteroid zone on.

RELATIVE PITCH ARRANGED ON A HELICAL STRUCTURE.

The numbers corresponding to the relative pitch of a tone, were measured along a helix, and lines were drawn connecting each multiple to its corresponding number. The general structure of the whole is not much changed when dealing with a helix rather than a straight line. The pattern appears characteristically the same. The dead ends of a multiple of 2×3 always linked to 5 and to 25 is apparent. We might have found a pathway to dealing with how patterns are formed, by dealing with sequence, not merely the result, an important difference not yet fully explored.

The third vibration would be at the orbit of Saturn, $\frac{1}{4}$ of the distance one way, or $\frac{3}{4}$ of the distance the other way.

The fourth vibration would be at Jupiter $\frac{1}{5}$ or $\frac{1}{16}$. The fifth vibration would be at Earth at $\frac{15}{16}$ or $\frac{1}{16}$. The sixth vibration would be at Mercury at $\frac{27}{22}$. Musically, this would read:

C', C", F', *, Eb+', F+ at 1/1, 1/2, 3/4, 7/8, 15/16 and 27/32

*% is an unpleasant flattened E... as is $\frac{27}{32}$. 15/16 is an unpleasant flattened D.





PLANETARY ORBITS OF THE SOLAR SYSTEM.

(Showing how a division by halves might encompass all the planets with the exception of Mars and Neptune).

The radii of each wave is equal to a distance of a planet from another planet. The distances were first plotted on graph paper for accuracy, where each square equalled 10 million miles.

Musically, a huge string could be imagined to be plucked between Mercury and Pluto. The first vibration would be the whole, running in a circle from the innermost to the outermost planets, and would indicate the beginning tone C. The second vibration would be an octave above at C.

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MATTER...

|... NON-MATTER

When the 125 point is placed at the center of a circle the rays of joining ratios on the 2×3 line appear to hold a sphere together. Contrariwise, when the other axis are placed as though they were on the outside rim of the circle, the ratios of 3×5 with 2×2 create an appearance of counterclockwise motion toward the center of the circle.

One half of the sphere is considered to be MATTER...

THE OTHER SIDE space... The alternating bands suggest this. When the radius is placed at the fourth line of the space side, the circles coincide with other circles representing a spin of direction to form a twist effect of INSIDE... OUTSIDE.





ZONE OF MATTER... ZONE OF NON-MATTER

A circle drawn with three rings, established by doubling the radius. When two other circles are drawn next to the original circle in the same proportion, and then a larger circle encompasses the whole, with its two counterparts, the points of intersection form a cluster of densely packed spheres.

This might be indicative of HOW matter is formed, and might have a visual similarity to electron shells.

THE HANDS... WITH RINGS CONTRACTING TOWARDS THE CENTER AND AWAY.

The hand is shown as an example of both contracting forces in contrary direction.

The points of intersection of the circles on the inside, and on the outside are indicated by the spheres... the laws of proportion at work in a visible manifestation.





THE SHELL ... AND RELATIVE PITCH

A circle was drawn with the dividing by halves principal. The quadrant on the left upper portion has divisions of nine parts. These are marked 1, 2, and 3, etc.. The second rim is divided into eight parts, numbered also. The ratios are read off a 1:1, 2:1, 3:2, 4:3, 5:4, 6:5 two blank spaces for 7:6 and 8:7, as they are not used in this system, and 9:8. The next ring has six divisions, the next five, etc. Since the margin of error is too great to deal with these proportions there is some distortion in the ray measurements, when drawn. However, the combination of the ring measurements and the ray measurements is so much like those of the shell that comparison can be made. To the upper right 16 points were counted off the horizontal radius, and the tones laid on them according to the ratios of their relative pitches to the beginning tone.

When colored rays are drawn to each tone and through to the other side... at the twist point the tone spectrum is reversed.

At the lower right, the tones are placed as they would fall on a grid in a wave form of crests and troughs. As would be expected tones B at 15:8, and B^b at 16:9 lie on a different plane... or dimension from the other tones.

THE SENSES... AND RELATIVE PITCH

A line was marked off proportionately into halves, thirds, fifths, eighths and fifteenths, horizontally. Vertically, the line was marked in onehalf, one-fourth, one-eighth and onesixteenth... to symbolize octaves. Where the lines intersected above, a sphere was placed. The sense of hearing, taste, smell, sight and touch arbitrarily occur within the clusters of intersections. Since the space from 1 to 15 is empty (1:1, 1:15), it becomes a field of invisible

ILLUSTRATION: C-11

energy waves.





HOW TO DETERMINE PROPORTIONS WITHIN A SPECIFIC RANGE ON MULTIPLES OF 5 X 2 AND 2 X 2

The green spheres mark the tones 256:243 and 375:256. When a line is drawn joining them, and this becomes the hypotenuse of a right angled triangle, 256 being a multiple of 2×2 at the eighth step, the axis can be marked off accordingly.

320 being the sixth step of multiplying 2×5 , it also can be marked off accordingly. When lines are drawn at each of these points crossing each other, a pattern of proportions forms, (Colored rectangles)...

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EYES EARS = IDEAS+



A HOROSCOPE BASED ON THE CIRCLE OF FIFTHS IN MUSIC.

Longitude 119.00° West, Latitude 37.00° North January 3, 1925 Time 24:00



DESCENDING CONTRACTING SCALE (The tones form the boundaries of the waves of sound...)

The placement of the tones (round spheres) is not arbitrary, but is based on the position of two coordinate axii with a diagonal running through, along which the tones lie. An absence of tones is called the void... a negative value. An abundance of tones within an area is then <u>matter</u>... a positive value. Four circles lie within the first 16 points. At 9/ 10, or the tone D-, the first <u>void</u> begins. At 24/25, or the tone D^b-, the void ends.

The series progresses in each reductive section from a multiplicity of zig zags, to a right angle to a single line, to a single point...

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A REVERES PROGRESSION BY SQUARES.

The spheres instead of aligning along a vertical as in the first "Progression by Squares" ("Glimpses of the Bridges of Art") disperse themselves in a form similar to the tones used on the diagonal of the Lambdoma diagram.

In other words, they scatter along a diagonal. The squares along the bottom are plotted at the intersection points of the dotted rays.

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MODULES ILLUSTRATING RATIOS. 1:2, 2:3, 3:4 etc.

On a Lambdoma grid of 16 fractions 1/1 to 16/16 one might portray the ratios as lengths differing by one unit placed one on top of the other. The areas marked "space" show the areas on which no ratios considered musical lie.

To the left the same pattern of locations are designated by small spheres on either side of the diagonal. Also on the right the four bar depressions indicate a negative space. The tone A 3:5 is seen to fall in this space area.

The dotted wavy line shows the tones used in the Lambdoma grid as a 60° section of a circle.

BARS REPRESENTING EACH TONE PERIODICITY ON A LAMBDOMA 'GRID.

This grid was set up so as to plot each segment of an interval based on multiples of the fractions. For instance, there are ten spaces or units in a given area of C (Do). One unit of F (Fa) encompasses three units of C. There are four sections of G to ten of C. A significance of this display is that one could plot the pulse beat of a visual sort, as well as the direction of an angle.





in halving TRiangles



SPACE FOLDS

These two folding illustrations show how space might actually look, like folded papers, by applying theories of intervallic relative pitch.

A folding in half equals the octave.

A folding in thirds equals the fifth.

A folding in fifths equals the third.

EARS = IDEAS

Since multiplying by its powers does not affect the placement of the tones, there are basically only eight concave and eight convex folds within an octave.

All the higher intervals of relative pitch such as ¹⁵/₁₆ are clustered around all intervals for D.

The isometric grid formed by the folds in the upper right are obviously formed by folding diagonally across rather than vertically as in the other drawing. The limits of the folding into ever smaller diagonals is always six.

The isometric lines show the generation of the familiar axes of multiples of 2, 3 and 5 and their combinations.

ILLUSTRATION: C-18

Also each fold line (darker) measures alternatively a diagonal and a side of ever diminishing squares.



COLOR MODULATION ON THE LAMBDOMA DIAGRAM.

Using the color coding key previously determined, based on complementary colors being related as opposites to fifths in music, a color spectrum appears based on a diaspason (or octave) of red, orange, yellow, green, blue, lavender and purpleblack. This sequence would appear on the half of the square known as the overtone series. The tones we have used up to this point are depicted as spheres. The second drawing from the left also depicts how one can chose complementary colors to depict tones, such as red (C) to blue (G) to orange (D) to lavender (A) to yellow (E) to black-purple (B) thus completing both a color cycle of complementaries plus a tone cycle of fifths. In this case the undertones instead of the overtone is depicted. The undertone being a lengthening instead of a shortening, and a downwards, or motion at right angles to the overtone becomes a reverse color cycle from red (C) to black-purple (B) to blue (G) to green (F) to yellow (E) to orange (D) and back to red (C).

Every forth, eight, sixteenth, etc., step of the overtone series the color and tonal sequence of the overtone series appears. The shift of color is horizontal in one case and vertical in the other.

The third square over depicts the octave relationships of both the overtone and the undertone, showing how the upper octaves fan out in ever increasing steps comparable to the lower octave.

The darker colors depict the deeper octaves. The lighter colors indicate the upper octave..

ILLUSTRATION: C-19

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SQUARING THE CIRCLE THE UNIVERSE CONSISTS OF BREATHING IN, BREATHING OUT, ONLY THE ORDER CHANGES.

The Lambdoma diagram carried further out would present a pattern of concentric rings with the spaces between each successive ring becoming wider. Therefore it is called an expansion. However when one halves in a direction toward the center the visual effect becomes the same. So that the paradox occurs that movement towards the center of the circle is expansion.

On the other hand when from half of the diameter of the circle the halving is completed away from the center, one can compare this to the dividing a string into %, %, %, 34 and 34 becoming visually a descending scale which is then a contraction.

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UNIFIED FIELD THEORY OF INTERVALS OF RELATIVE PITCH LAID ON AN ARRAY OF FRACTIONS (PYTHAGOREAN TABLE, OR LAMBDOMA DIAGRAM).

Top shows how the intervals would look spacially if at the place where each tone falls were knotted. The zig zag to the left indicates the folding process as well as ascending fifths on one side, and descending fourths on the other, one side being a multiple of two, the other side being a multiple of three.

The bottom right is a depiction of the theories of the Mayan Katon Calendar falling in the spaces between D^b , 9/10 and B^b , 8/15, and B 9/16 and D^b + 15/16...

The counter clockwise movement forms an eleven pointed star.





SIXTY FOUR SQUARES OF THE LAMBDOMA DIAGRAM COLORED ACCORDING TO COLOR TONE THEORIES.

The upper horizontal set of colored squares depicts the overtone series in music. When a string is struck other harmonies occur at the same time. The order of these harmonics are in great leaps at the beginning, an octave first and then a fifth, another octave and then a third, then a minor sixth, and finally a scale of whole tones to half tones. The verticals always follow the theoretical undertones series. which instead of being octave to fifth, becomes octave to fourth, octave, sixth, fourth, second, then a descending whole tone to half tone scale, as contrasted with the ascending overtone scale.

The overtone scale also would diminish in a special sense, while the undertone would lengthen in a special sense. The diagonal colors all represent the same tone the same octave range, a constant, and also a hypotenuse of a right triangle. The upper half of the square cut by its diagonal would be in the upper octaves, while the lower half would be in the lower octaves. Also the upper half would represent a contraction while the lower half would represent an expansion.

As a tone is struck, each tone beginning from its point on the diagonal shifts a space back on the horizontal, and shifts a space on the vertical. This already creates paradoxical situation. Rays are visibly emanating from the source of the sound. On one side, the overtone side, the colors go from red to orange to yellow to green to blue to purple to red. On the other side, the undertone part, the colors go from lavender to blue to green to yellow to orange to red when they again begin to fluctuate widely into complementaries or fifths musically.



PATTERNS OF THE SPHERES TAKE PLACE ... ON THE OTHER DIMENSION... SPACE.

The radius is always n x 6. n is represented by the number of triangles within a circle. If there are six triangles in the first circle n = 6 and $6 \times 6 = 36$. The relationship of r to circumference, is always one more triangle than that within the circle. The construction was as follows: Lines were divided into 6, 5, 4, 3, and 2 parts. Ratios of 8:9, 7:8, 5:6, 4:5 and 3:4 can be seen in the five circles.

ILLUSTRATION: C-23

EYES + EARS = IDEAS



SHOWING HOW RATIOS CAN BE LINKED TO DEGREES OF A CIRCLE... AND HOW THE SMALLER THE ANGLE THE MORE FREQUENT THE PULSE BEAT

This drawing is still another way of depicting ratios according to polygonal shapes within a circle. Any ratio with the number 3 in it, for example, would have a degree of 120, since dividing a circle into three sections, and joining these sections at the center, yields an angel of 120°. The numbers used are then 4, 6, 8, 9, 10, 16, 20, 24 and 45. They are arranged in a three dimensional shape as though they were constructed of clear plexi-glass. It is easy to see that the nearest wedge of five winged shapes based on the ratio 5:6 Eb+ would have 60° as its angle (6 sides of a polygon) and the 5 wings to represent the other part of the fraction and suggesting pulse beats.

EYES + EARS = IDEAS

COORDINATE AXES IN SIX DIMENSIONS.

This is a way of showing how a grid might be set up on which to lay the Lambdoma diagram. In this way the twist point is shown in detail, the different colors indicate a complementary relationship of underside to outside in terms of color... The basically triangular pattern of each line is made obvious.



LAMBDOMA DIAGRAM BEGINNING TONE "G" BLUE



ILLUSTRATION: C-26

LAMBDOMA DIAGRAM BEGINNING TONE "D" ORANGE



LAMBDOMA DIAGRAM BEGINNING TONE "E" YELLOW



RULES FOR LAMBDOMA DIAGRAM.

The octave pattern is the same on both sides of the diagonal.

The progression is two spaces

four spaces eight spaces

eight spaces

sixteen spaces ... a doubling.

The octave or key, F, C, G, D or beginning tone, always divides the grid into two sections at right angles to one another.

Still staying in the beginning tone, on the third square, 3/3, the doubling takes place using three as a base.

Both horizontally and vertically a symmetry takes place so that mathematically and visually a mirror image is sustained.

The ratios 1/2, 2/4, 3/6, 4/8, 5/10, 6/12, 7/14, 8/16 and their inversions fan out in an ever increasing distance from the diagonal, at angles of $22\frac{1}{2}$ degrees.

The ratios of 2/8, 3/12 and 4/16 and their inversions, fan out at angles of approximately 11 degrees ($\frac{1}{2}$ of 22 $\frac{1}{2}$)...

Complementary colors are like cadences in music.

The complementary colors seem to always proceed by doubling no matter what the beginning tones in music.

Whereas the beginning tone is always perfectly symmetrical on the horizontal and vertical, the following tones such as the 5th and 3rd are non-symmetrical.

For instance, there are three vertical bands to one horizontal band dealing with 5ths, 1/3 and 2/3, 4/3, 8/3, 16/3 in the first vertical column:

1/6, 2/6, 4/6, 8/6, and 16/6 in the second vertical column: 1/12, 2/12, 4/12, 8/12, 16/12 in

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ILLUSTRATION: C-26, C-27 & C-28

LAMBDOMA DIAGRAM BEGINNING TONE "A" LAVENDER



the 3rd vertical column as opposed to 5/1, 5/2, 5/4, 5/8 and 5/16 in one horizontal row. The other fractions of the 5th tone could be likened to accidentals in music.

In 3rds or the fifth place on the undertone axes in distinction from 5ths on the third place on to creation. the overtone axes there are only two vertical bands doubling fractions: 1/5, 2/5, 4/5, 8/5, 16/5 ... 1/10, 2/10, 4/10, 8/10 and 16/10.

The other 6 non-symmetrically arrayed fractions can again be compared to accidental tones fifths, with the important in music...

We can conclude that an encounter between the energy of the vertical undertone and horizontal overtone produces in the first phase a perfect symmetry of waves and in the second phase a broken symmetry and in the third phase a still more fractionated symmetry. sequence where as we said there are If we remember that the overtone is an infinitely diminishing sequence of progressions increasing in frequency, while the undertone is a continuing lengthening sequence based on doubling of whole numbers we have the infinitely small interacting with the infinitely large

in either annihilation whether it is contracting The undertone in its three horizontal bands bands to counter-balance the one This might indicate that there is progression of the vertically based might assume impede the horizontal

LAMBDOMA DIAGRAM BEGINNING TONE "F" GREEN

or creation depending on to annihilation or expanding

downward series of fourths takes doubling by threes, the inversion of difference that there are no vertical horizontal band of the overtone. nothing to stop the horizontal undertone until we come to the next two vertical undertone bands which we thrust...

ILLUSTRATION: C-29 & C-30

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UNDERTONE

OVERTONE

The Pythagorean table (Lambdoma diagram) is depicted in its actual proportions of division (horizontally) and multiplication (vertically) the beginning tone 1/1 is D.

The shape of the subsequent multiples of the beginning which normally fall along the diagonal in diamond shapes change from a rectangle to a square to a vertical rectangle 3/3 to ever lengthening vertical rectangles which eventually become longer and longer lines. The circular lines become as peeled off layers of

the undertone vertical bands. If the grid were set up on the curvilinear format it would take the shape of the upper right portion, the beginning tone in this case initiating the sequence at F. The coordinate axes X and Y curve as opposed to the coordinated axes of X, and Y, .



LOOP UNDERTONE OVERTONE In this case the basic Lambdoma grid is located on a three dimensional fold of a loop... to show how the grid may be located on a convex surface. The lines extending from the X (OVERTONE) axis and the Y (UNDERTONE) axis form loops...

ILLUSTRATION: C-32

EYES + EARS = IDEAS



LAMBDOMA ON EITHER SIDE OF TUNING TUBE.

This drawing is another way of showing how the Lambdoma diagram can be organically fitted into a convex three dimensional form. If one were establishing a beginning musical tone it would tend to resemble this figure before the tuning had become stabilized to a pure musical tonality. The oval shape to the left would represent a perfect tuning, a pure tune...

A LAMBDOMA GRID FORMED BY TWO INTERSECTING ELLIPTICALS.

THE BEGINNING TONE in this case is G (blue). On the overtone side the progression is from blue to purple, while on the undertone side the progression is from blue to yellow (top left). At right angles to the diagonal G (blue) just mentioned, to the right the overtone extends from blue to purple to blue to green to yellow to orange and to red, with the spaces between the diamond shaped tones being purple between the blues, blue red and yellow red between the blue and the lavender, yellow orange and yellow green between the purple and the blue.

Always the colors separate to their adjacent tonalities, horizontally and to their polarities within the same color vertically.

On the left the same process occurs but is reversed entirely. The sequence is from blue to green to yellow to orange to red to purple to blue, with the background colors also changing top to bottom within the same tonal family.

The bottom group clearly shows the right left complementary pairs, blue on the left and red on the right.

The significance of the color combinations is that they are linked directly to the assigned tones based on fifths in music and laid out on an extended Lambdoma grid of fractions used as ratios in music.



ILLUSTRATION: C-34

EYES + EARS = IDEAS



PLAN FOR A SERIES OF TRIANGLES DROPPED AT ANGLES WITHIN A CIRCLE.

Each triangular form lies in a different plane.

Some have different dimensions based on three equidistant concentric circles. The angles were determined by polygon to angle relationships based on the relative pitch of musical tone (interval of musical tone).

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EYES + EARS = IDEAS

EXTENSION OF THE FOURTH DIMENSION OF SPACE. (SQUARE PLANETS IN ORBIT).

If lines are drawn from the different planes of surface, such as a square, one could say that these extensions were an example of the fourth dimension. If each line has a different vibration or pulse ----,

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its character could thus be determined.

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ILLUSTRATION: C-36

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