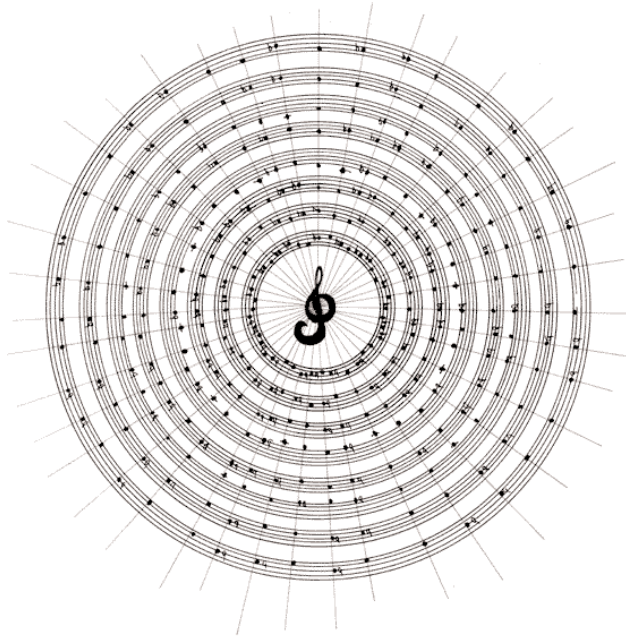


# SELECTED WRITINGS



la monte young & marian zazeela

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*Selected Writings*

La Monte Young & Marian Zazeela

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**1. NOTES ON THE CONTINUOUS PERIODIC COMPOSITE  
SOUND WAVEFORM ENVIRONMENT REALIZATIONS OF “MAP  
OF 49’S DREAM THE TWO SYSTEMS OF ELEVEN SETS OF  
GALACTIC INTERVALS ORNAMENTAL LIGHTYEARS TRACERY”**

(Also published in ASPEN, September, 1969, edited by Dan Graham.)

“Map of 49’s Dream The Two Systems of Eleven Sets of Galactic Intervals Ornamental Lightyears Tracery” consists of a total environmental set of frequency structures of sound and light – a collaboration of my work with light projections and designs created by Marian Zazeela. Although the work is a section of “THE TORTOISE, HIS DREAMS AND JOURNEYS” it is different from the previous sections and will have its own subsections, each of which will receive an individual title. A major difference is that all work on this section has taken place since I began to write “2-3 PM 12 XI 66-3:43 AM 28 XII 66 FOR JOHN CAGE FROM ‘VERTICAL HEARING OR HEARING IN THE PRESENT TENSE’” which I have since revised under the title “THE TWO SYSTEMS OF ELEVEN CATEGORIES 1:07:40 AM 3 x 67 –”. I have concentrated primarily on selected intervals from categories A1, B1, and A2, B2, X=5 from the latter work.

“The Two Systems of Eleven Categories” applies to sets of concurrent generating frequencies which may be represented as integral multiples of a common fundamental and outlines a means for achieving graduated degrees of control over which frequencies will be present within a complex of such concurrent generating frequencies and their associated combination frequencies. Generating frequencies are refined to be the prime, or zeroth order, combination frequencies from which all higher order combination frequencies are derived. The nth order ( $n > 0$ ) combination frequencies are defined to be the

sum and difference frequencies produced by all lower order combination frequencies. This control is achieved by categorizing sets of concurrent generating frequencies according to the specific generating and combination frequencies to be excluded.

Consider the premise that in determining the relationship of two or more frequencies the brain can best analyze information of a periodic nature. Since chords in which any pair of frequency components must be represented by some irrational fraction (such as those required for any system of equal temperament) produce composite sound waveforms that are infinitely non-repeating, only an infinite number of lifetimes of listening could possibly yield the precise analysis of the intervallic relationship. Consequently the human auditory mechanism could be best expected to analyse the intervallic relationships between the frequency components of chords in which every pair of components can be represented by some rational fraction, since only these harmonically related frequencies produce periodic composite sound waveforms.

As sources for the frequency environments I have selected sine waves since they have only one frequency component. These are produced by frequency generators tuned both by ear and with an oscilloscope which continuously displays the generator frequency ratios with Lissajous and intensity modulated ring patterns. Most recently I have been using a Moog Synthesizer with ultrastable variable frequency sine wave oscillators designed for my work.

To my knowledge there have been no previous studies of the long term effects on continuous periodic composite sound waveforms on people. (Long term is defined to be longer than a few hours in this case.)

My past work in music with sounds of long duration slowly led in this direction until it became possible for me to develop a situation allowing the study of truly

continuous sounds by establishing continuous frequency environments with electronic instruments. I have maintained an environment of constant periodic sound waveforms at my studio and home continuously since September 1966. The only exceptions have been that I sometimes, but not always, turn off the equipment when no one will be in the environment at all, and when listening to “other music.” Also, I sometimes turn it off to test the acoustical situation for spurious (incidental) sounds, and to study the contrasts of such extended periods of sound with periods of silence.

The sets of frequency ratios listened to are often played continuously 24 hours a day for several weeks or months. Marian Zazeela and I have worked and lived in this environment, and varied groups of people have been invited to listen and report their reactions to the frequencies.

Although in 1957 I was originally drawn to work with sounds of long duration by intuition alone, my work of this nature has led to the formulation of three principles which suggest further study:

1. Tuning is a function of time. Since tuning an interval establishes the relationship of two frequencies in time, the degree of precision is proportional to the duration of the analysis, i.e. to the duration of tuning. Therefore, it is necessary to sustain the frequencies for longer periods if higher standards of precision are to be achieved. The fact that this information is not generally known to musicians may be one reason that only a few examples of pitches of long duration such as organum, pedal point, and the drone are to be found in music. On the other hand, astronomers have known for some time that if a measurement or comparison is to be made of two orbits which involve many years of time, the degree of precision of the measurement will be proportional to the duration for which the measurement is made.\*

2. Consider the possibility that the number of complete cycles of a periodic composite waveform is a primary factor in recognizing an interval and/or in determining the degree of precision in tuning once the interval has been recognized. If this were the case, ratios comprised of lower frequencies (such as 52.5 Hz: 30 Hz = 7:4) would have to be sustained for longer periods of time than the identical ratios comprised of higher frequencies (such as 840 Hz: 480 Hz = 7:4), in order to produce an equivalent number of complete cycles of their periodic composite waveforms.

3. In the tradition of modal music a fixed tonic is continued as a drone or frequently repeated, and a limited set of frequencies with intervallic relationships established in reference to the tonic is repeated in various melodic permutations throughout a performance in a particular mode. Generally, a specific mood or psychological state is attributed to each of the modes. The place theory of pitch identification postulates that each time the same frequency is repeated it is received at the same fixed place on the basilar membrane and transmitted to the same fixed point in the cerebral cortex presumably by the same fiber or neuron of the auditory nerve. The volley theory of pitch perception assumes that a sequence of electrical impulses is sent traveling along specific neurons of the auditory nerve. For frequencies up to about 2000 Hz. only, these produce a more or less complete reproduction of the frequency of the vibratory motion of the basilar membrane in the case of a single sine wave and a more or less distorted reproduction of the complete waveform for more complex signals. It is presumed that this reproduction will be best for sounds at lower frequencies and less good for higher frequencies since an individual neuron cannot fire faster than 300 Hz. At lower frequencies a group of neurons working together would be able to supply several pulses per cycle whereas at higher frequencies they could only supply one every several cycles. The assumptions of place theory and volley theory suggest that when a specific set of harmonically related frequencies is continuous, as is often the case in my music, it could more

definitively produce (or stimulate) a psychological state that may be reported by the listener since the set of harmonically related frequencies will continuously trigger a specific set of the auditory neurons which in turn will continuously perform the same operation of transmitting a periodic pattern of impulses to the corresponding set of fixed points in the cerebral cortex.

When these states are sustained over longer periods of time they may provide greater opportunity to define the psychological characteristics of the ratios of the frequencies to each other.\*\*

\*A notable example of the application of principles 1 and 3 is the classical music of India which has nearly always included a sustained drone and has evolved and actually practices the most highly developed system of modal scales and moods related to modes in the history of music.

\*\*Ibid.

## 2. DREAM HOUSE

LA MONTE YOUNG

MARIAN ZAZEELA

DREAM HOUSE

A continuous frequency environment in sound and light with singing from time to time.

Opens Sunday 6 July 1969 at 15 h; continues through 19 July 1969.

The environment in sound and light at Galerie Heiner Friedrich will be continuous during the hours 10 to 18 and later on some days, Monday through Saturday. Visitors who wish to hear us sing with the continuous frequency environment may telephone the gallery to find out if we are or expect to be singing on that particular day and during which hours.

By 1962 La Monte had formulated the concept of a Dream House in which a work would be played continuously and ultimately exist in time as a "living organism with a life and tradition of its own.."

Much of our work has focused on the relationship of the media to time, or on time directly. Time is so important to the experiencing and understanding of our work that the installation for two weeks duration at Galerie Heiner Friedrich will provide the most realistic environment for its realization we have so far encountered. This presentation will be our most complete public statement to date.

The work presented within this model Dream House will be the longest contin-

uous public performance at periodic intervals of a section from “Map of 49’s Dream The Two Systems of Eleven Sets of Galactic Intervals Ornamental Lightyears Tracery” from the longer work “The Tortoise, His Dreams And Journeys,” and will consist of a total environmental set of frequency structures in the media of sound and light.

Two sources will be used to produce the frequencies in the sound medium: sine wave oscillators will generate a continuous live electronic sound environment during the hours the gallery is open; and we will sing additional frequencies at time intervals to be determined. Light frequencies will be manipulated in the gallery rooms with the specially designed installation of floating sculptures and dichroic sources.

#### I. Continuous Live Electronic Sound Environment

Sine waves have the unique characteristic among sound wave forms of having only one frequency component. All other sound wave forms have more than one frequency component. When a continuous frequency is sounded in an enclosed space such as a room, the air in the room is arranged into high and low pressure areas. In the high pressure areas the sound is louder, and in the low pressure areas the sound is softer. Since a sine wave has only one frequency component, the pattern of high and low pressure areas is easy to locate in space. Further, concurrently sounding sine waves of different frequencies will provide an environment in which the loudness of each frequency will vary audibly at different points in the room, given sufficient amplification. This phenomenon can rarely be appreciated in most musical situations and makes the listener’s position and movement in the space an integral part of the sound composition.

Various intervals, triads, and chords composed of sine waves will be produced

electronically in the different rooms of the gallery over the two week period allowing the listener to actually experience sound structures in space in the natural course of exploring the environment. Each of the intervals and chords is selected beforehand from “The Two Systems of Eleven Categories 1:07:40 AM 3 X 67 – ” (first revision of “2-3 PM 12 XI 66 – 3:43 AM 28 XII 66 for John Cage’ from ‘Vertical Hearing Or Hearing In The Present Tense’”). The frequency components of the sine waves are tuned on highly stable sine wave oscillators using oscilloscopes to achieve chords and intervals in which every pair of frequency components can be represented by some rational fraction. This produces a frequency environment of periodic composite sound wave forms. The ratios of the amplitude components of the sine waves are tuned with voltage meters to be inversely proportional to the ratios of their corresponding frequency components. In addition to the precise control over the intervallic ratios established among the sine waves, the control over the frequencies of the combination tones produced when more than one sine wave is sounded at one time is an important structural element of the work. In order to achieve this control only certain combinations of frequencies from the pre-selected set of chords and intervals are permitted to be sounded concurrently. 50 Hertz AC (derived from 220 volt power line frequency) will be used as the standard to which all other frequencies are related and tuned since it functions as the underlying drone of the city and all AC-powered equipment. The sine wave oscillators may be retuned from time to time to produce new intervals and chords, and recircuited to change the number of sine waves in each room. The frequency ratios being played will be displayed continuously as lissajous and intensity-modulated ring patterns on oscilloscopes so that visitors to the gallery can study them and their relation to what they hear.

#### II. Light Frequency Environment

This will be the first public presentation of the light environment which Marian

designed to accompany the continuous periodic sound wave forms. Her work with slides as performed in concert with La Monte's music since 1965 provided the basis in mixtures of colored light frequencies which is of central importance in the new work. The intention of the work is to exploit the inherent properties of colored light mixtures combines with specific forms to produce a fluid, variable environment which appears to contain self-luminous colored bodies freely suspended in an atmosphere of continually moving calligraphic strokes. The pieces were created and inspired by just those conditions of continuous frequency sound structures in the studio that they will exist in at the gallery. In fact, the slow shifting movements of the forms and their multiple shadows in space recall the slow phase drift of two sine waves in rational relationship as displayed in lissajous figures on an oscilloscope.

The installation will consist of the suspension of flat white metal mobiles hung by filaments from the ceilings of the rooms which shape light by reflecting the colors of light sources directed at them from points below, and simultaneously cast colored shadows on the ceiling and upper walls of the room. Each metal piece is positioned in relation to the other pieces to form a part of a total design. The colors of the shadows cast by each piece vary with the colors of the light sources projected on it, and the distances of the piece from the source and the ceiling. Each piece appears to be that portion of the color spectrum which it reflects at any one moment, and all other available colors mix to form its shadows. Thus if a piece has two lights, red and green, projected on it from different angles, it will at various times appear red, green, or yellow, depending upon the luminance and angles of incidence of the lights it faces, but it will continually cast two shadows, a reddish shadow from the green light source, and a greenish shadow from the red light source.

With careful placement of light sources, and use of dichroic filters to create intense, near-pure colors, secondary and tertiary shadows are also cast by the

auroras of the light sources, evolving very complex configurations of shape and shadow. Slight air currents, such as those set in motion by people in the room, gently move each mobile around its suspension axis causing variations in the hue and luminance of the color it reflects, the existence and shape of its shadows, and the relation of it and its shadows to the other mobiles and their respective shadows. As these variations of color, shape, light and shadow in response to vibration occur in the space over a period of time, time becomes an essential dimension of the work.

### III. Frequencies Sung at Time Intervals To Be Determined

A particularly interesting aspect of the continuous performance situation is the possibility that it may free the artists from the artificiality of measured time, and allow them to perform in real time. Once a situation is created in which the artists may sing several hours a day, several days a week, for a few weeks, it no longer seems important to fix an auspicious evening at 20h two months or six months in the future (with no possible way of determining what circumstances will have evolved in the lives of the artists or in the world at large in the intervening months) and then at that pre-selected moment place the artists on stage and command them to sing (or produce in whatever media)! Although this feat must be within the technical capabilities of every great performer, one must recognize that most artists can only be expected to produce their best work on the inspiration of their muse, and at those time during the day or week when their physical and mental powers are at noticeable peaks. Certain aspects of the structure of the vocal work are specifically organized to be determined by the performers during the performance, which requires that we must be as sensitive as possible to the demands of the work and to all interacting forces which may bear a direct relationship to the work at just that point in time when it is being performed, and in part, created.

Therefore, no predetermined singing times will be set, rather the artists plan to sing frequently during the 10 to 18 hours, Monday through Saturday, and later on some days, for the duration of the show. If it should be known at any point in advance that they will sing at a particular time the information will be given to people who telephone. However, the live performance of the electronic sound and light environment will be continuous during gallery hours so that visitors are also expected to come without phoning since there is a good chance they will hear some portion of a three-to-four hour vocal performance as well. It is hoped that visitors will come several times during the period of the show since this will best allow them to experience the aspects of the work that are inherently dependent on time.

The artists will sing intervals from “The Two Systems of Eleven Categories”, chosen to be sustained over a drone produced by one or more of the sine waves in the environment.

[included is a diagram of DREAM HOUSE]

“... In Dream Music there is a radical departure from European and even much Eastern music in that the basis of musical relationship is entirely harmony. Not European harmony as textbooks have outlined it, but the intervallic proportions and acoustical consequences of the particular ratios which sound concomitantly in the overtone series when any simple fundamental is produced. Melody does not exist at all (The Disappearance of Melody) unless one is forced to hear the movement from group to group of various simultaneously sounded frequencies derived from the overtone series as melodic because of previous musical conditioning. Even before the first man moved successively from one frequency to another (melody if you like) a pattern for this movement, that is the relationship of the second frequency to the first was already predetermined (harmonically) by the overtone structure of the fundamental of the first sound.

An in the life of the Tortoise the drone is the first sound. It last forever and cannot have begun but is taken up again from time to time until it lasts forever as continuous sound in Dream Houses where many musicians and students will live and execute a musical work. Dream Houses will allow music which, after a year, ten years, a hundred years or more of a constant sound, would not only be a real living organism with a life and tradition all its own but one with a capacity to propel itself by its own momentum. This music may play without stopping for thousands of years, just as the Tortoise has continued for millions of years past, and perhaps only after the Tortoise has again continued for as many million years as all of the tortoises in the past will it be able to sleep and dream of the next order of tortoises to come and of ancient tigers with black fur and omens the 189/98 whirlwind in the Ancestral Lake Region only now that our species has had this much time to hear music that has lasted so long because we have just come out of a long quiet period and we are just remembering how long sounds can last and only now becoming civilized enough again that we want to hear sounds continuously. It will become easier as we move further into this period of sound. We will become more attached to sound. We will be able to have precisely the right sound in every dreamroom playroom and workroom, further reinforcing the integral proportions resonating through structure (re: earlier Architectural Music), Dream House (shrines, etc.) at which performers, students, and listeners may visit even from long distances away or at which they may spend long periods of Dreamtime weaving the ageless quotients of the Tortoise in the tapestry of Eternal Music ...”

(from concert program notes, 1964

C La Monte Young 1968)