

) Paintings based on relative pitch in music

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PAINTINGS BASED ON RELATIVE PITCH IN MUSIC

Barbara Hero*

Abstract—The author's approach to painting changed direction in 1961 when she began formal studies of music. She adopted relative pitch as a measure for quantitatively differentiating musical tones represented in her paintings. Specifically, the pitch of a tone was designated in terms of the ratio of its frequency to that of middle C on a piano. She chose a scale with the aid of the Lambdoma diagram or Pythagorean table. The values of the resulting relative pitches and their reciprocals were appropriate for the representation of tones by radii or by areas in her paintings. In addition, for each musical tone she has assigned a specific color, a designation that she generally keeps constant. All the paintings of this series are of a geometrical character.

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I.

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 non-traditional 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 three-dimensional 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

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.

Sabri 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 I 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

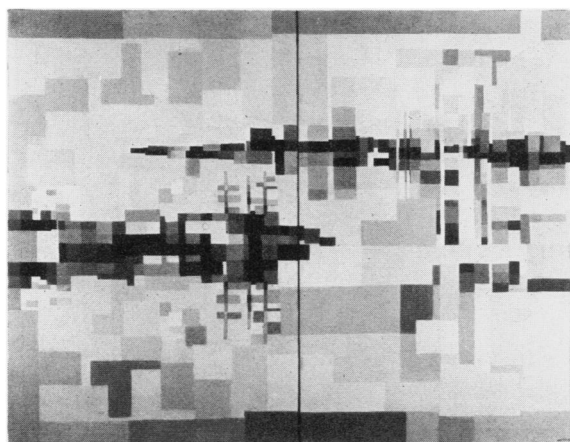


Fig. 1. 'W.R.S. No. 5', acrylic on canvas, 36 × 48 in., 1961.

* Artist living at 48 Lawrence Street, Boston, MA 02116, U.S.A. (Received 14 May 1973.)

to a train of pressure waves (i.e. sound waves) that spread in air in sphere-like ripples rather like two-dimensional 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 pitch* 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^1 (la) in the octave of c^1 (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^1 (do), although another tone such as f^1 (fa) might also have been a good choice (cf. Table I). Thus, for example, the relative pitch of e^1 (mi) is the frequency of e^1 (330) divided by the frequency of c^1 (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^{II} , 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^1 ; and C in the octaves above is given correspondingly by c^{II} , c^{III} , c^{IV} , . . . ; 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_1 , c_{II} , c_{III} , Thus the tones for C are represented in a sequence of increasing pitch by . . . c_{III} , c_{II} , c_1 , c , c^1 , c^{II} , c^{III} , Within an octave, for example, c^{II} to c^{III} , the other tones are labeled correspondingly by, e.g. e^{II} , f^{II} , g^{II} ; or between c and c^1 , they would be e , f , g ; or between c_1 and c , they would be e_1 , f_1 , g_1 . 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^{I+} [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

(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 f^1 (fa) (relative pitch $4/3$) and d^1 (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^1 and d^1 , respectively. I do not often use a complete dodecapronic scale, i.e. one made up of 12 halftones (semitones), because the relative pitch of its tones, for example, g^1 , does not match that of g^1 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 (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

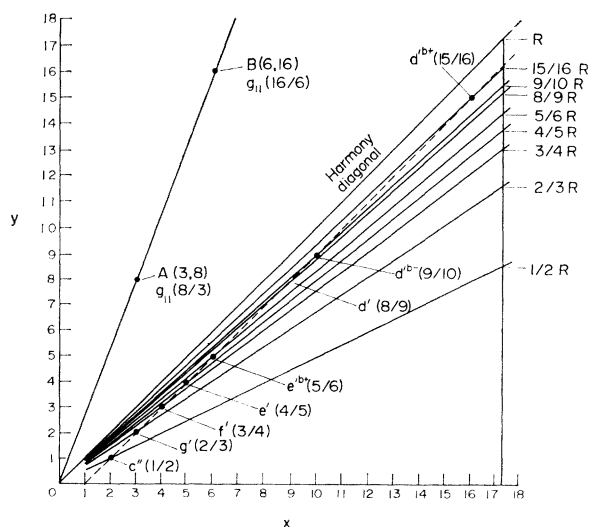


Fig. 2. Lambdoma diagram.

TABLE I. A COMPOSITE SCALE. RELATIVE PITCH BASED ON MIDDLE C

Tone	Middle C c ¹	d ^{b++}	d ¹⁻	d ¹	e ^{b++}	e ¹	f ¹	f ^{1#}	g ¹	a ^{b-}	a ^{b++}	a ¹	b ^b	b ^{b++}	b ¹	c ¹¹
Frequency (cycles/sec.)	264	282	293	297	317	330	352	371	396	413	422	440	469	475	495	528
Relative pitch [9]	1/1	16/15	10/9	9/8	6/5	5/4	4/3	45/32	3/2	25/16	8/5	5/3	16/9	9/5	15/8	2/1
Reciprocal relative pitch	1/1	15/16	9/10	8/9	5/6	4/5	3/4	32/45	2/3	16/25	5/8	3/5	9/16	5/9	8/15	1/2
Diatonic intervals	tonic	semi- tone	minor tone	major tone	minor third	major third	perfect fourth	tri- tone	perfect fifth		minor sixth	major sixth	minor seventh	minor seventh	major seventh	octave
Sequence of tones in Fig. 3 starting from the origin of the Lambdoma	(1)	(9)			(6)	(5)	(4)		(3)				(8)		(7)	(2)

TABLE II. COLORS, NUMBERS AND PLANETS ASSIGNED TO TONES

Tone	C	D ^{b++}	D ⁻	D	E ^{b++}	E	F	F [#]	G	A ^{b-}	A ^{b++}	A	B ^b	B ^{b++}	B
Assigned colors	red	scarlet	red- orange	orange	yellow- orange	yellow- orange	green	green	green- blue	green- blue	blue	blue- violet, violet	purple	red- purple	black
Assigned planets [12]	Venus	Neptune	Mars	Mars	Unknown planet	Jupiter	Mercury	Uranus	Earth	Pluto	Asteroids	Asteroids	Unknown planet	Saturn	Saturn
Assigned whole Numbers [12]	54	51		48	45	42	81 (80) =	76 (75) =	72 (36) =	68 (69) =		64 (63) =	60		56 (57) =

way, then Fig. 2 would take on the usual appearance of a Lambdoma grid. Here the fraction y/x is taken to represent the reciprocal of the relative pitch and hence the point A (3, 8) corresponds to the tone g_{11} (8/3).

It should be pointed out that g_{11} is not uniquely represented by point A . Point B , which is given by (6, 16) also corresponds to g_{11} , 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 I), 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^{b+} (5/6), d' (8/9) and d^{b-} (9/10). The tones of the scale that are not on the line are a' (3/5), a^{b+} (5/8) and b^{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 sharpened or flatted (indicated by one, two or three plus or minus marks).

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]. Rothchild discussed the application of her color-music analogy in her paintings in *Leonardo* [10]. My

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 c' . Since the reciprocal relative pitch for c' is 1/1 and that for c'' at one octave higher is 1/2, I made the radius of the circular orbit for c'' half as long as the radius for c' by simply knotting the string at its center. Rather than folding 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.

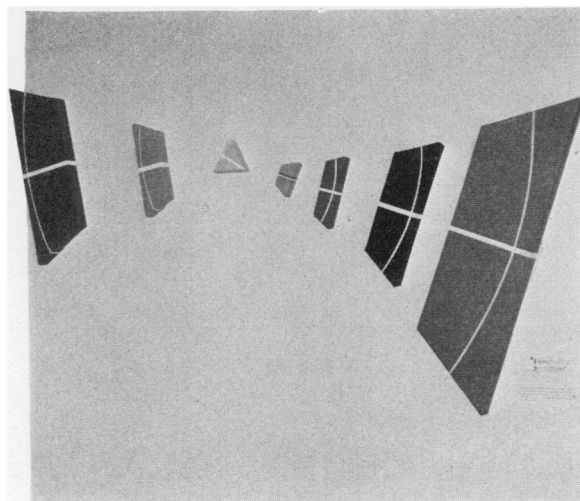


Fig. 3. 'Isoceles Trapezium', acrylic on canvas, wall space 78 × 78 in., 1973.

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^1 (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^1 ($4/3$) and another one in violet for $a^{1\sharp}$ (or b^{1b}) ($16/9$). To the right of the triangle is a small panel (yellow orange) that represents e^{1b+} (or $d^{1\sharp}$) ($6/5$), followed respectively by panels for g^1 ($3/2$), blue; b^1 ($15/8$), black and d^{1b+} ($16/15$), 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, I 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^1 , or a sharped a^1) 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 whole-number scheme in Table II, I assigned to tone a^1 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^{1b} ($9/16$), d^{1-} ($9/10$), e^{1b+} ($5/6$), g^1 ($2/3$) and c^1 ($1/1$) respectively. I could have chosen a^{1+} ($27/16$) or d^{1+} ($15/16$) for the 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).

III.

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

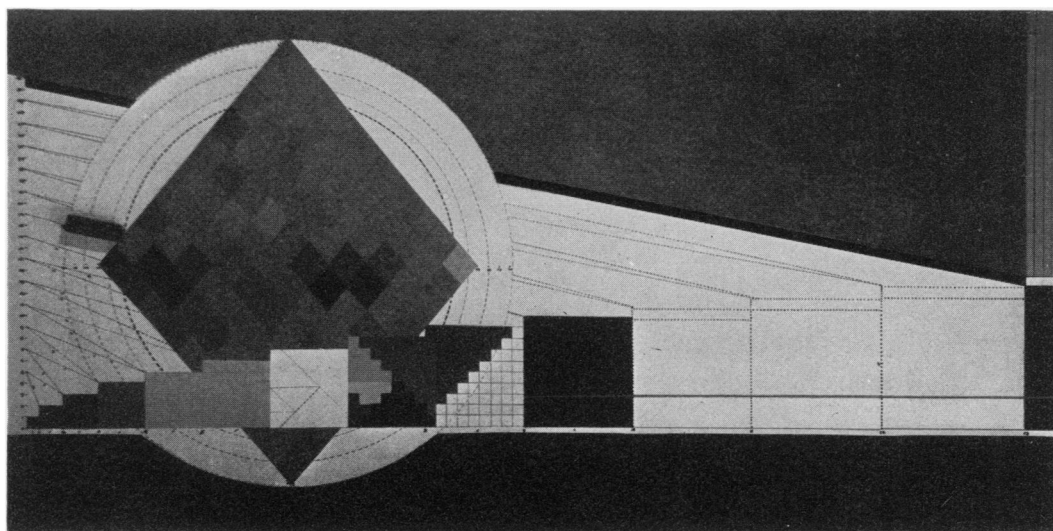


Fig. 4. 'Progression by Squares', acrylic on canvas, 76 × 36 in., 1971.

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 planets 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^1 (Mercury) [12], then the corresponding list of planets will occur in the order of positions from the Sun (i.e. Mercury, f^1 ; Venus, c^{1+} ; Earth, g^1 ; Mars, d^{1+} ; asteroids, a^{1+} ; Jupiter, e^{1+} ; Saturn, b^{1+}). 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^1 , g^1 , d^1 , a^{1+} , e^{1+} 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; $F^\sharp$, dark green; $C^\sharp$, scarlet; $G^\sharp$, green-blue. When this color scale is examined with respect to a sequence of fifths (i.e. f^1 , c^1 , g^1 , d^{1+} , a^{1+} , e^{1+} , b^{1+} , f^{1+} , c^{1+} (d^{1+}), g^{1+} (a^{1+})), 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 f^{1+} is reached at every seventh step, the pitch of f^{1+} and g^{1+} , 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^{1+} being pale grey; e^{1+} , pale blue; and b^{1+} , 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^1 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

remaining tones from this circle of fifths; d^{1+} , rust; g^{1+} (f^{1+}), dark grey-blue-green; d^{1+} (e^{1+}), yellow grey-green and a^{1+} (e^{1+}), grey-violet. The series of concentric circles drawn immediately below the center of the 'anticircle' represents the orbits of the 14 fifths: f^1 , c^1 , g^1 , d^{1+} , a^{1+} , e^{1+} , b^{1+} , f^{1+} , c^{1+} (d^{1+}), g^{1+} (a^{1+}), d^{1+} (e^{1+}), a^{1+} (b^{1+}) and e^{1+} (f^{1+}). It is important to mention that *double fifths* (a double fifth means skipping a fifth) place the tones in the following ascending order: f^1 , g^1 , a^{1+} , b^{1+} , c^{1+} (d^{1+}), d^{1+} (e^{1+}), e^{1+} (f^{1+}), (f^{1+}), where after seven tones (seven planets) the cycle begins again. Descending *single* fifths place the second time at b^{1+} , the order reading: e^{1+} , a^{1+} , d^{1+} , g^{1+} , b^{1+} , e^{1+} , a^{1+} , d^1 , g^1 , c^1 , f^1 , or descending *double* fifths: f^{1+} , e^{1+} , d^{1+} , b^{1+} , a^{1+} , g^1 , f^1 , 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 II). 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

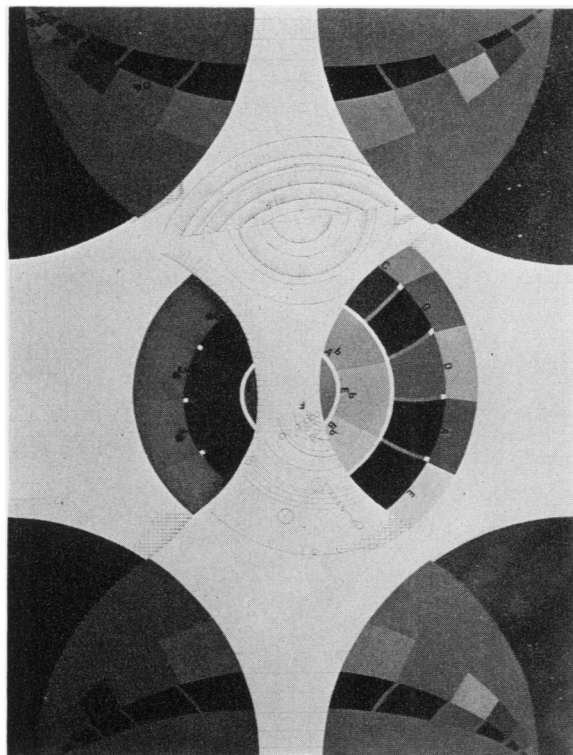


Fig. 5. 'Circle of Fifths', acrylic on canvas, 48 × 36 in., 1971.

the Pythagorean third and $81/80$ expresses the difference in relative pitch between $E^\sharp$ 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, I 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).

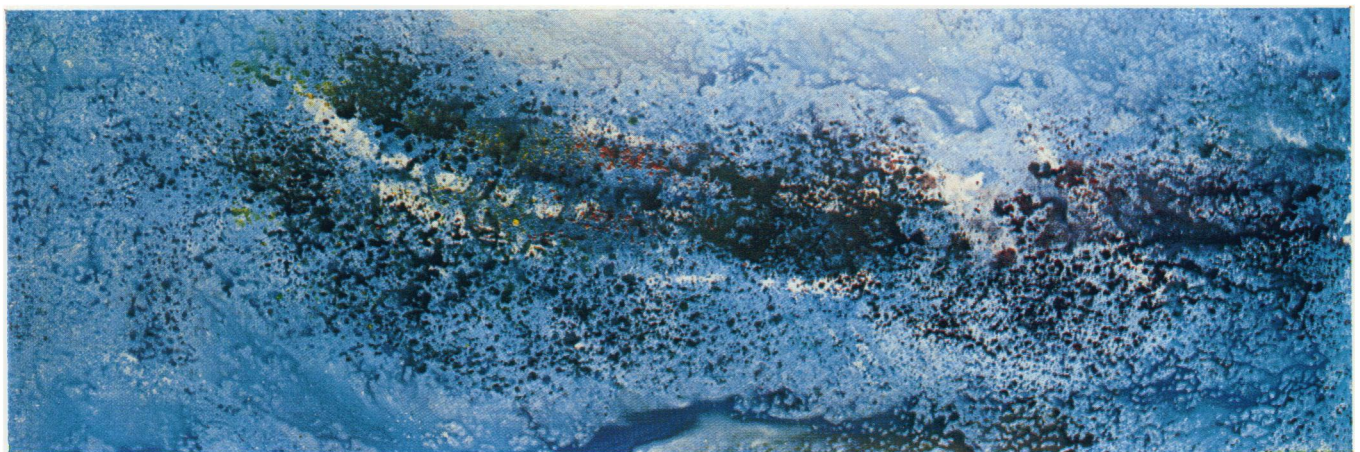
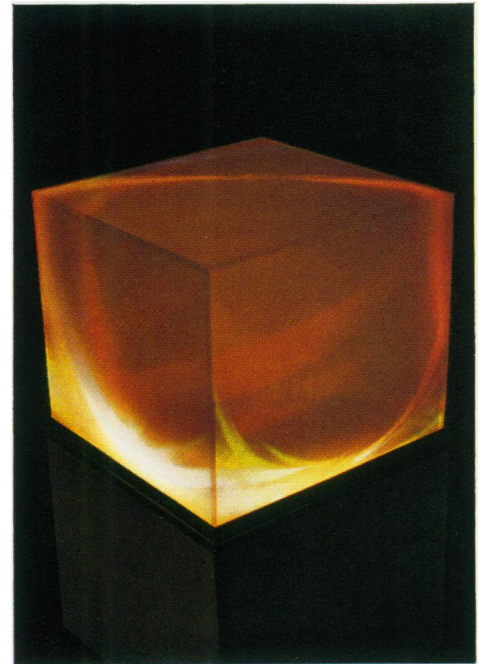
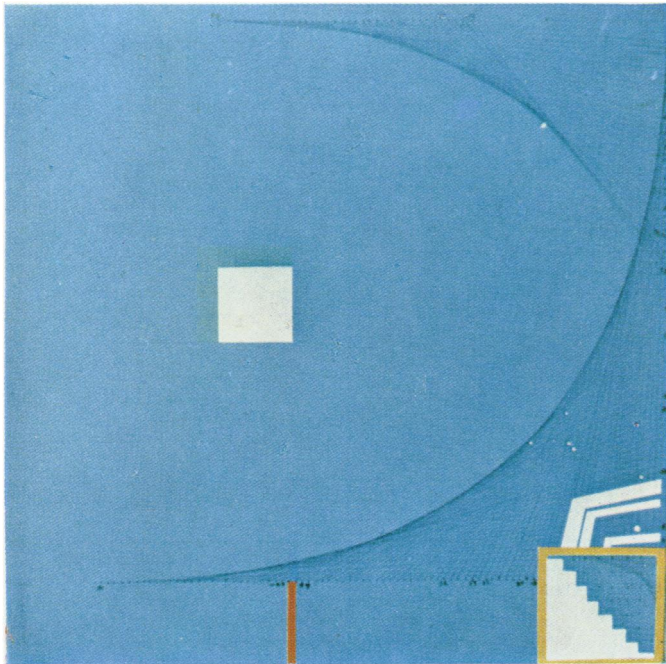
I then plotted small circles (difficult to see in the reproduction, Fig. 6) to represent the musical tones $f^{\sharp\sharp}$ (relative pitch $64/45$), $f^{\sharp\sharp\sharp}$ ($36/25$), $f^{\sharp}$ ($27/20$), $f^\sharp$ ($45/32$), and $f^{\flat\flat}$ ($25/18$) [16]. The circle for $f^{\sharp}$, for 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 $f^{\flat}$

(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 musical 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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Top: Jacques Decaux. 'Mary' (name in Chinese 'seal' characters), enamel on copper, 50 × 80 cm., 1966. (Fig. 1, cf. page 41.)

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

Centre, right: Dick Cook. 'Whistling Dixie', audio-kinetic object, Luminetic system, Plexiglas cube, Formica base, incandescent lamps, 24 × 14 × 14 in., 1971. (Photo: G. de Grazio, Thibodaux, LA, U.S.A.) (Fig. 4, cf. page 2.)

Bottom: Cynthia Polsky. 'Grotto, II', acrylic paint on canvas, 42 × 122 in., 1973. (Fig. 1, cf. page 53.)