

DARK FORCES SIGNIFY

FOR THREE RETUNED, COMPUTER-DRIVEN PIANOS

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Technical Specifications

The 33-pitch tuning of the three pianos (the same in every octave) is as follows, given first in the number of cents above E-flat, and then as ratios to the E-flat 1/1:

Piano	1		2		3	
D	1088	15/8	977	225/128	1044	117/64
Db	969	7/4	938	55/32	906	27/16
C	857	105/64	773	25/16	840	13/8
B	738	49/32	755	99/64	729	195/128
Bb	702	3/2	590	45/32	609	91/64
A	551	11/8	551	11/8	481	169/128
Ab	471	21/16	440	165/128	408	81/64
G	386	5/4	320	77/64	342	39/32
Gb	204	9/8	275	75/64	275	75/64
F	155	35/32	192	143/128	192	143/128
E	92	135/128	53	33/32	27	65/64
Eb	0	1/1	1103	121/64	1173	63/32

Note that no string needs to be raised higher than its natural tuning except for the B-flat on piano 1, which is 2¢ sharp (or if one prefers, 2¢ could be subtracted from all quantities).

For electronic realization of the piece, it can prove helpful to reconfigure the tuning as a reference pitch in cycles per second for each piano, and ratios derived from that standard:

Tuning pitch:	38.891 cps	36.7641 cps	38.2833 cps
D	15/8	225/121	13/7
Db	7/4	20/11	12/7
C	105/64	200/121	104/63
B	49/32	18/11	65/42
Bb	3/2	180/121	13/9
A	11/8	16/11	169/126
Ab	21/16	15/11	9/7
G	5/4	14/11	26/21
F#	9/8	150/121	25/21
F	35/32	13/11	143/126
E	135/128	12/11	65/63
Eb	1/1	1/1	1/1

In the configuration of certain tuning softwares, the following sequences might facilitate getting the required tuning:

Piano 1:

38.891 = Eb0

1/1, 135/128, 35/32, 9/8, 5/4, 21/16, 11/8, 3/2, 49/32, 105/64, 7/4, 15/8

Piano 2:

36.7641485 = Eb0

1/1, 12/11, 13/11, 150/121, 14/11, 15/11, 16/11, 180/121, 18/11, 200/121, 20/11, 225/121

Piano 3:

38.283333 = Eb0

1/1, 65/63, 143/126, 25/21, 26/21, 9/7, 169/126, 13/9, 65/42, 104/63, 12/7, 13/7

For purposes of analysis, the entire scale (which I refer to as my 8x8 scale) is given below, grouping its pitches into eight harmonic series' on the 1st, 3rd, 5th, 7th, 9th, 11th, 13th, and 15th harmonics of E-flat, and naming each pitch in a typographical equivalent of Ben Johnston's just-intonation notation:

Pitch name	Ratio	Cents	1/1	3/2	5/4	7/4	9/8	11/8	13/8	15/8
Db^^-	121/64	1103						11		
D	15/8	1088	15	5	3					1
Db13	117/64	1044					13		9	
C#+	225/128	977								15
Db7	7/4	969	7			1				
C^	55/32	938			11			5		
C+	27/16	906		9			3			
C7+	105/64	857				15				7
Cb13	13/8	840	13						1	
B	25/16	773			5					
Bb^	99/64	755					11	9		
Cb77+	49/32	738				7				
Bb13	195/128	729							15	13
Bb	3/2	702	3	1						
Bbb713	91/64	609				13			7	
A+	45/32	590		15	9		5			3
Ab^	11/8	551	11					1		
Abb1313	169/128	481							13	
Ab7+	21/16	471		7		3				
G^	165/128	440						15		11
G+	81/64	408					9			
G	5/4	386	5		1					
Gb13	39/32	342		13					3	
Gb7^	77/64	320				11		7		
F#+	75/64	275			15					5
F+	9/8	204	9	3			1			
Fb13^	143/128	192						13	11	
F7+	35/32	155			7	5				
E+	135/128	92					15			9
Eb^	33/32	53		11				3		
Eb13	65/64	27			13				5	
Eb	1/1	0	1							
Eb7+	63/32	1173				9	7			

In Johnston's notation, + raises a pitch by 81/80, # raises it by 25/24, b lowers it by 24/25, 7 lowers it by 35/36, ^ raises it by 33/32, 13 raises it by 65/64, and F-A-C, C-E-G, and G-B-D are all perfectly tuned 4:5:6 major triads.

A couple of notes on listening to *Hyperchromatica*:

Some people think the piano sounds seem “funny” or “unreal.” It is essential to the timbre of a normal piano that the intervals are slightly out of tune, and surrounded by the fuzziness of the resulting beats. Remove that out-of-tuneness and the piano can sound different than you’re used to. It has always been common for me to play La Monte Young’s *The Well-Tuned Piano* for people and have them respond, “Isn’t that electronic?” “It sounds more like bells than a piano.” Often one’s unfamiliarity with pure tuning is misperceived as a deficiency in the piano sound. Relatedly, when I issued a disc of Disklavier music in 2005, people sometimes commented, “Too bad you couldn’t use a real piano, because the electronic sounds are off-putting.” In fact, the Disklavier *was* a real, acoustic piano, with pluckable strings. It was tuned to 18th-century well temperament, the notes went by *very* fast, and so the divergences from normalcy made people’s brains convince them that it was an electronic piano, which was a false perception. Give yourself some time to listen to the pieces over and over, and you’ll probably get used to them. I can guarantee, after hundreds of listenings myself, that the harmonies make their own purely-tuned sense, and that their logic sinks in once you can anticipate what’s going to happen. One of the purposes of these pieces is to expand your musical perception.

The Disklavier (computer-driven piano, the digital manifestation of the player piano) is a different medium than the human-played piano. One can, and must, write for it differently. With a couple of deliberate exceptions, these pieces are not playable by humans. The composer forbids performance by humans (which can’t happen anyway), and will not cooperate with any such attempt. The computer-driven version is the final manifestation, and the only one contemplated or permitted. These pieces were written, after years of profound thought and experimentation, specifically for the Disklavier medium, without any compromise in what the music was intended to achieve. If it bothers you that the music you are listening to isn’t being played by humans, there are millions of piano recordings made by humans; go listen to them. There is too much music in the world for anyone to waste time listening to any music wishing it were something other than what it is. This music is produced mechanically, for a mechanical quality of rhythm that I savor. I make this music public on the chance that there might be a handful of other people on the planet for whom the possibilities opened up here in terms of rhythmic and harmonic language might more than compensate for the loss of a few habitual comforts. If you are not one of those rare people, you can do the composer a favor by moving on without comment. I guarantee you will not alter his mind on the matter.

- Kyle Gann

Dark Forces Signify

Kyle Gann
2016

♩ = 64

Piano 1

Piano 2

Pno1

Pno2

Pno1

Pno2

Pno3

10

Pno1

Pno2

Pno3

Ped.



14

Pno1

Pno2

Pno3

Ped.

p

17

Pno1

Pno2

Ped.

Ped.

Ped.

Ped.

Ped.



20

Pno1

Pno2

Ped.

Ped.

Ped.

Ped.

Ped.

23

Pno1

Pno2

Pno3

5

Ped.

Ped.

Ped.

26

The musical score consists of three systems, each for a different piano part (Pno1, Pno2, Pno3). Each system contains two staves (treble and bass clef).
- **Pno1:** Starts at measure 26 with a treble clef. The first staff has a complex chordal structure. The second staff has a melodic line with a dotted quarter note. The third staff has a rhythmic pattern of eighth notes.
- **Pno2:** Features a treble clef. The first staff has a whole rest. The second staff has a whole note chord. The third staff has a rhythmic pattern of eighth notes, with two measures marked "Ped." (pedal).
- **Pno3:** Features a bass clef. The first staff has a whole rest. The second staff has a whole note chord. The third staff has a rhythmic pattern of eighth notes, with two measures marked "Ped." (pedal). The final measure of the third system includes a dynamic marking "p" (piano) and a "Ped." marking.

30

Pno1

Pno2

Ped.



33

Pno1

Pno2

Pno3

Ped.

37

Pno1

Pno2

Pno3

Ped. _____

Ped. _____

Ped. _____



40

Pno1

Pno3

Ped. _____

Ped. _____

44

Pno1

p

Ped.

Pno2

p

Ped.

Measures 44-46. Pno1: Treble clef, 4/4 time. Measure 44: Quarter note G4, quarter note A4, quarter note B4, quarter note C5. Measure 45: Rest. Measure 46: Rest. Pno2: Treble clef, 4/4 time. Measure 44: Chord G4-A4-B4-C5. Measure 45: Bass line: quarter notes G2, A2, B2, C3, D3, E3, F3, G3. Measure 46: Bass line: quarter notes G2, A2, B2, C3, D3, E3, F3, G3. Pedal points are marked under the bass lines of Pno1 and Pno2.



47

Pno1

Ped.

Pno2

Ped.

Measures 47-49. Pno1: Treble clef, 4/4 time. Measure 47: Chord G4-A4-B4-C5. Measure 48: Rest. Measure 49: Chord G4-A4-B4-C5. Pno2: Treble clef, 4/4 time. Measure 47: Rest. Measure 48: Bass line: quarter notes G2, A2, B2, C3, D3, E3, F3, G3. Measure 49: Chord G4-A4-B4-C5. Pedal points are marked under the bass lines of Pno1 and Pno2.

49

Pno1

5

Ped.



52

Pno1

Pno2

Pno3

Ped.

55

Pno1

Pno2

Pno3

The musical score consists of three systems, each for a different piano part (Pno1, Pno2, Pno3). The music is written in 4/4 time with a key signature of one flat. The first measure of each system is in 4/4 time. At the beginning of the second measure, the time signature changes to 3/4 for all three parts. The score includes various musical notations such as chords, eighth notes, and sixteenth notes. Pedal markings ('Ped.') are placed below the bass lines of Pno1, Pno2, and Pno3, indicating where the sustain pedal should be used. The Pno1 part features a complex texture with chords and eighth notes. The Pno2 part has a more melodic line with some chords. The Pno3 part has a steady eighth-note accompaniment in the bass line.

59

Pno1

Ped.

p

Pno2

Ped.

Pno3

Ped.

63

Pno1

Ped.

Pno2

Ped.

66

Pno1

Pno2

Pno3

The musical score consists of four measures. Pno1 (Piano 1) has a treble staff with a single sharp (F#) in the first measure and a complex chord in the third measure, and a bass staff with a rhythmic pattern of eighth notes. Pno2 (Piano 2) has a treble staff with a complex chord in the first measure and a single sharp (F#) in the second measure, and a bass staff with a rhythmic pattern of eighth notes. Pno3 (Piano 3) has a treble staff with a complex chord in the first measure and a single sharp (F#) in the second measure, and a bass staff with a rhythmic pattern of eighth notes. Pedal markings are present in the bass staves of Pno1, Pno2, and Pno3.

70

Pno1

Pno2

Pno3

Ped.

p

5

Ped.

Ped.

Ped.

Detailed description: The image shows a musical score for three pianos, labeled Pno1, Pno2, and Pno3. The score begins at measure 70. Pno1 (top system) has a treble and bass staff. The treble staff has a melodic line starting with a fermata in the first measure, followed by a sequence of notes with a 'p' dynamic marking. The bass staff has a rhythmic accompaniment with 'Ped.' markings. Pno2 (middle system) has a treble and bass staff. The treble staff has a block of chords in the first measure, followed by a melodic line. The bass staff has a rhythmic accompaniment with 'Ped.' markings. Pno3 (bottom system) has a treble and bass staff. The treble staff has a block of chords in the first measure, followed by a melodic line. The bass staff has a rhythmic accompaniment with 'Ped.' markings. The score is written in a key signature with one flat (B-flat) and a common time signature.

73

Pno1

Ped. _____

Pno2



77

Pno1

Ped. _____

Pno2

Pno3

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80

Pno1

Pno2



83

Pno1

Pno2

Pno3

87

Pno1

Pno2

Pno3

Ped.

p

The musical score consists of three systems, each for a different piano (Pno1, Pno2, Pno3).
- **Pno1:** Treble and bass staves. Measure 87 starts with a complex chordal texture in the treble and a continuous eighth-note bass line. Pedal markings are present under the bass line. The system ends with a dynamic marking *p*.
- **Pno2:** Treble and bass staves. Sparse chordal accompaniment.
- **Pno3:** Treble and bass staves. Sparse chordal accompaniment.

91

Pno1

Ped.

Pno2

p

Pno3

p

94

Pno1

Pno2

Pno3

p

Ped.

Ped.

98

Pno1

Ped. Ped. Ped. Ped.

Pno2

5

Ped.

Pno3

101

Pno1

f

Ped. Ped.

Pno3

105

Pno1

Ped.

Pno2

f

mf

Ped.

Pno3

f

mf

Ped.

109

Pno1

Pno3

The musical score is divided into two systems, Pno1 and Pno3. Pno1 consists of a grand staff with a treble clef and a bass clef. The right hand has a whole rest in the first measure, followed by a complex texture of sustained chords and arpeggiated patterns in the second measure. The left hand has a whole rest in the first measure, followed by a steady eighth-note arpeggiated pattern in the second measure. Pno3 also consists of a grand staff. The right hand has a melodic line starting with a grace note and a finger number '5', followed by a sustained chord. The left hand has a steady eighth-note arpeggiated pattern. Dynamic markings 'mf' and 'Ped.' are present in both systems.

112

Pno1

ff

mf

Ped.

Pno2

ff

Ped.

Pno3

ff

Ped.

116

Pno1

Pno2

Pno3

The musical score consists of three systems, each for a different piano (Pno1, Pno2, Pno3).
- **Pno1:** Treble and bass staves. Treble staff has a whole note chord (F#4, C5) in measure 116. Bass staff has a half note chord (Bb3, F#3) in measure 116, followed by eighth notes in measures 117 and 118. Dynamics: *mf*. Pedal markings: *Ped.* in measures 116 and 117.
- **Pno2:** Treble and bass staves. Treble staff has a half note chord (F#4, C5) in measure 116. Bass staff has a half note chord (Bb3, F#3) in measure 116, followed by eighth notes in measures 117 and 118. Dynamics: *ff* and *mf*. Pedal markings: *Ped.* in measures 116 and 117.
- **Pno3:** Treble and bass staves. Treble staff has a half note chord (F#4, C5) in measure 116. Bass staff has a half note chord (Bb3, F#3) in measure 116, followed by eighth notes in measures 117 and 118. Dynamics: *mf*. Pedal markings: *Ped.* in measures 117 and 118.

120

Pno1

Pno2

Pno3

mf
Ped.

The musical score is for three pianos (Pno1, Pno2, Pno3) on page 25. The tempo is marked as 120. The key signature has one flat (B-flat). Pno1 and Pno2 play a melody in the right hand and a bass line in the left hand. Pno3 plays a bass line in the left hand. The score consists of four measures. Pno1 and Pno2 have a dynamic marking of *mf* and a Pedal marking. Pno3 has a Pedal marking.

124

Pno1

Pno2

Pno3

mf

mf

mf

Ped.

Ped.

Ped.

The musical score is divided into three systems, each for a different piano (Pno1, Pno2, Pno3). The piece begins at measure 124. Pno1 (top system) has a treble clef and plays a 5-fingered chord in the right hand. Pno2 (middle system) has both treble and bass clefs; the right hand plays a 5-fingered chord, and the left hand plays a piano accompaniment marked *mf*. Pno3 (bottom system) has a bass clef and plays a piano accompaniment marked *mf*. Pedal markings (Ped.) are present for Pno2 and Pno3, indicating sustained notes.

127

Pno1

Pno2

Pno3

The musical score consists of three systems, each for a different piano (Pno1, Pno2, Pno3). The time signature is 3/4. Pno1 starts at measure 127 with a complex texture of chords and a pedaled bass line. Pno2 and Pno3 are mostly silent, with some final notes and a pedaled bass line at the end of the system.

131

Pno1

Ped.

Pno2

Ped.

Pno3

Ped.

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135

Pno1

Pno2

Pno3

The musical score consists of three systems, each for a different piano (Pno1, Pno2, Pno3). The first system (Pno1) starts at measure 135 and features a complex texture with chords in the upper staves and a rhythmic accompaniment in the lower staff. The second system (Pno2) has a sparse accompaniment with some chords and rests. The third system (Pno3) also has a sparse accompaniment with some chords and rests. Pedal markings (Ped.) are present under the Pno1 and Pno2 staves.

139

Pno1

139

Pno2

139

Pno3

139

142

Pno1

Ped.

Ped.

Pno3



146

Pno1

Ped.

Ped.

Pno3

Dark Forces Signify

150

Pno1

p

Ped.

Pno3

p

Ped.



154

Pno1

p p

Ped.

Pno2

p

Ped.

Pno3

p

Ped.

158

Pno1

Pno2

Pno3

Red.



161

Pno1

Pno3

Red.

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Germantown, NY