

# Barlicity

a modular work for  
piano and fixed media

by Marc Evanstein

## Notes for the Performer

*Barlicity* is a modular work that can be presented in three different configurations, under the following names:

- 1) *Barless* for piano and detuned sine waves
- 2) *City* for stereo fixed media
- 3) *Barlicity* for piano and fixed media

*Barless* is essentially a solo piano work, but one in which the perceived tuning of the piano is modified through a backdrop of detuned sine waves. Through their interference with the notes being played, these sine waves bend certain pitches a little up or down in a calculated way. The result is a kind of just intonation. An interesting side effect of this process is the beating and timbral inflection of the affected notes<sup>1</sup>.

*City* is a stereo, fixed-media work. It started out as an accompaniment to *Barless*, consisting of fast, scalar runs on a General MIDI harpsichord, runs which were designed to complement the rhythmic motion of the piano. Ultimately, I decided to send this MIDI data into the CREATE Modular Synthesizer at UCSB and (through many mixes and iterations) turn it into a stand-alone fixed-media piece.

While mixing *City*, I made a conscious effort to maintain its complementarity with the piano part of *Barless*. (This was a major challenge, since sometimes what worked well for the tape part on its own did not work well when paired with the piano, or vice-versa.) The end result is that *Barless* can be combined with *City*—rather than with the sine wave backdrop—to form a work for piano and fixed media, one which is truly a duet of independent parts. I call this combination *Barlicity*, in tribute to my former teacher Clarence Barlow.

In both *Barless* and *Barlicity*, the fixed media part is to be coordinated with the piano via a click track. There is a slight difference in the length of the multirests in these two configurations, as noted at the bottom of page 4 of the score.

The three configurations of *Barlicity* can be presented individually, played sequentially as a three-movement work, or spread throughout a concert program.

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<sup>1</sup> For example, an A played at 440 Hz, when combined with a sine wave at 432 Hz produces a resultant frequency of 436 Hz with a beating at 8 Hz. (Of course, this ignores overtones, but I found the result to be most effective with pure sine waves.)

## Notes on the Compositional Process (Optional)

*Barlicity* is so named because it resulted from an exploration of several ideas of the composer Clarence Barlow.

The first of these ideas is the rhythmic concept that he terms *indispensability*. Indispensability is a way of assigning numerical values for the weight of different pulses in a meter. For instance, the six eighth note pulses in a measure of 3/4 have indispensability values of 5, 0, 3, 1, 4, and 2. These numbers indicate that the most important pulse is the downbeat, followed by the third and then the second beat. The offbeats are, of course, less important, and are ordered in accordance with the beat that they lead into. By contrast, the six eighth note pulses in 6/8 have indispensability values of 5, 0, 2, 4, 1, and 3, emphasizing the division of the measure into two main dotted-quarter beats.

The handiness of having numerical values for pulse importance is that we can use this information in creating algorithmic music. For instance, in the piano part to *Barless/Barlicity*, I used indispensability to help choose how low or high a pitch is, with lower pitches falling on more significant beats. (To avoid this getting repetitive, I also sometimes inverted the indispensability values to create syncopations.) In *City*, I used indispensability to determine when running passages should start and stop.

The second concept of Clarence's that I adopted for this piece is called *harmonicity*, and is essentially a numerical expression of the stability/consonance of a pitch interval. Any whole-number frequency ratio has an associated harmonicity value that can be calculated from the prime factorization of its numerator and denominator. The smaller the prime numbers involved, the more harmonic the ratio; so, for instance, the ratio 9:8 has a far greater harmonicity than the ratio 8:7, because 9, though larger than 7, reduces to 3<sup>2</sup>.

Although harmonicity can only be measured for whole-number frequency ratios, Clarence devised a system for "rationalizing" a set of cent values into a just intoned scale, maximizing the harmonicity between members of the set. For instance, inputting the cent values for a major scale—0, 200, 400, 500, 700, 900, 1100, 1200—we might get the following ratios<sup>2</sup>:

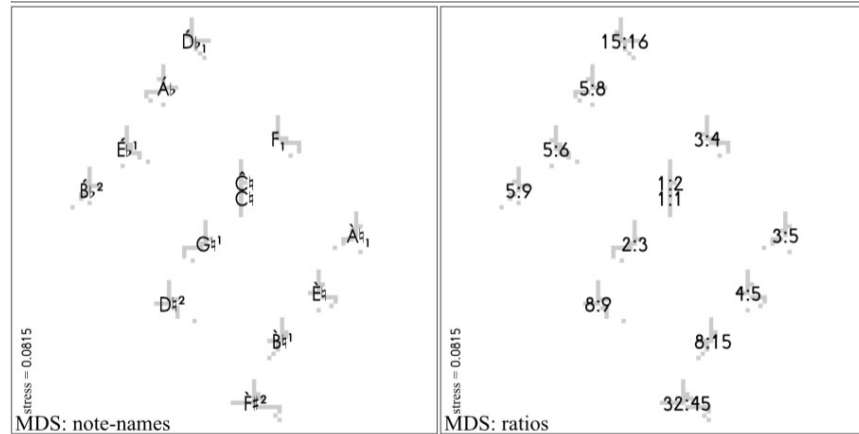
1/1   9/8   5/4   4/3   3/2   5/3   15/8   2/1

Since harmonicity is a measure of the harmonic relatedness of two pitches, one of its more evocative applications is to use it in combination

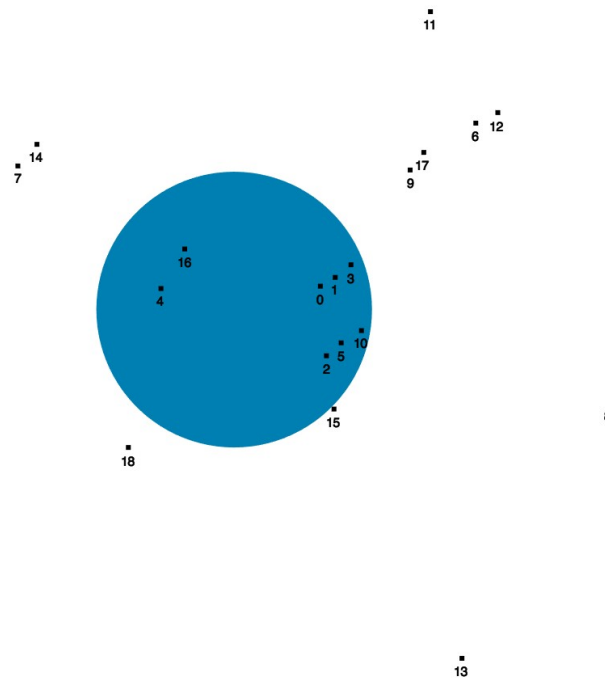
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<sup>2</sup> There is a tradeoff between the simplicity of the ratios and the fidelity to the desired cent tuning. The process has parameters to adjust this balance.

with a process called multidimensional scaling create a map of a given tuning. The following such graph of the 12 tones of a (just-intoned) chromatic scale is taken from Clarence's *Musiquantics*, and you can see that closely harmonically related notes are nearby to one another:



This finally brings us back to *Barlicity*. In composing the piano part, I re-implemented Clarence's scale rationalization system in Python and used it to derive a just tuning of the Bark scale<sup>3</sup>. I then used multidimensional scaling to create a map of these pitches, such that more harmonically related pitches are closer together. Finally, I allowed the piano to wander around this space, drawing from different regions over the course of the piece. The following is a screenshot of a visualization that I made (the notes the piano is currently playing are in the blue circle):



<sup>3</sup> [https://en.wikipedia.org/wiki/Bark\\_scale](https://en.wikipedia.org/wiki/Bark_scale)

# Barless / Barlicity

Marc Evanstein

## Ruminating

for Piano and Fixed Media

♩ = 125

*p cantabile*

(clicktrack)

*p cresc.*

*mf* *mp dim.*

*pp* *mp molto* *f*

Ped.

22 *p cresc.* *f* *rf*

ten.

Detailed description: This system contains measures 22 through 26. The music is written for piano in a key with one sharp (F#). The right hand features a melodic line with slurs and accents, while the left hand provides a steady accompaniment. Dynamic markings include piano (*p*), crescendo (*cresc.*), forte (*f*), and fortissimo (*rf*). A 'ten.' marking is present in the right hand at the end of measure 25.

27 *mp* *pp*

Detailed description: This system contains measures 27 through 31. The right hand continues with a melodic line, and the left hand has a consistent accompaniment. Dynamic markings include mezzo-piano (*mp*) and pianissimo (*pp*).

32 *mf* *dim.* *p pointed*

Detailed description: This system contains measures 32 through 36. The right hand has a more active melodic line with slurs and accents. Dynamic markings include mezzo-forte (*mf*), diminuendo (*dim.*), and piano (*p*) with a 'pointed' marking.

37 *cresc.* (*mf*)

Detailed description: This system contains measures 37 through 41. The right hand features a melodic line with slurs and accents. Dynamic markings include crescendo (*cresc.*) and mezzo-forte (*mf*).

42 *sub. p molto legato* *pp* *p* *mp*

48 *p dolce*

53 *cresc.* *f* *molto marcato e secco*

57 *mp cresc.*

61 *ff* *sub. pp*

65 *ff* *p* *mf*

70 *p* *p* *pp* *p* *8va*

76 *ppp* *sfz* *sfz*

(8) *15ma*

$5/8^*$   $3/2^*$

$5/8$   $3/2$

\* When performing "Barless", rest for the first duration indicated;  
when performing "Barlicity", rest for the second duration instead.



*p* delicate (quasi  $\leftarrow$ ) *mf*

*p* cresc.

88

3 2/3\* 3 2/3

99

*ff* *p* *mf*

8va

105

*f* like popcorn *mp*

110

sub. *p* *f* *mp*

114 *hopping* *p*

Musical score for measures 114-118. The piece is in 2/4 time. The right hand features a melodic line with slurs and accents, while the left hand provides a rhythmic accompaniment with chords and single notes. A dynamic marking of *p* (piano) is present. The word *hopping* is written above the staff.

119

Musical score for measures 119-123. The right hand continues the melodic line with slurs and accents. The left hand accompaniment includes chords and moving lines. A dynamic marking of *p* is visible.

124 *cresc.*

Musical score for measures 124-128. The right hand features a melodic line with slurs and accents. The left hand accompaniment includes chords and moving lines. A dynamic marking of *cresc.* (crescendo) is present. The time signature changes to 2/4.

129 *fp*

Musical score for measures 129-133. The right hand features a melodic line with slurs and accents. The left hand accompaniment includes chords and moving lines. A dynamic marking of *fp* (fortissimo) is present. The time signature changes to 3/4.

*molto cresc.* **ff** *flowing continuously*

134

*dim.*  
**(p)**

**f** *dim. poco a poco*

139

**p** *cresc.*  
**f** *dim. poco a poco*

144

**p** **f**

**pp** **f** *ringing* **f** **(p)**

149

**pp** **f** *ringing* **f** **(p)**  
**(p)**

154 *f* (*p*) *mf* 8

158 (*pp*) *mf* (*pp*) *dim. poco a poco*

163 *8va both hands* -----

(8) ----- | *15ma both hands* ----- | *niente*

(repeat several times and fade)