Small Changes Lead to Big Results: The Music of Steve Reich

Gareth E. Roberts

Department of Mathematics and Computer Science
College of the Holy Cross
Worcester, MA

Topics in Mathematics: Math and Music
MATH 110 Spring 2018
April 26, 2018

Steve Reich

- Born in New York City, October 3, 1936, to the Broadway lyricist June Stillman.
- Parents divorce early in his life, resulting in split time between New York and California, and long train rides providing future inspiration for his piece *Different Trains*.
- Piano lessons at a young age were inconsequential. Interest in music blossoms at the age of 14 when he starts studying drums with Roland Kohloff.
- Attends Cornell University from 1953-57 majoring in Philosophy but also taking some music courses.
- Returns to New York to study musical composition, first studying privately with Hall Overton (1957-58) and continuing on at the famous Juilliard School with Bergsma and Persichetti (1958-61).

Steve Reich (cont.)

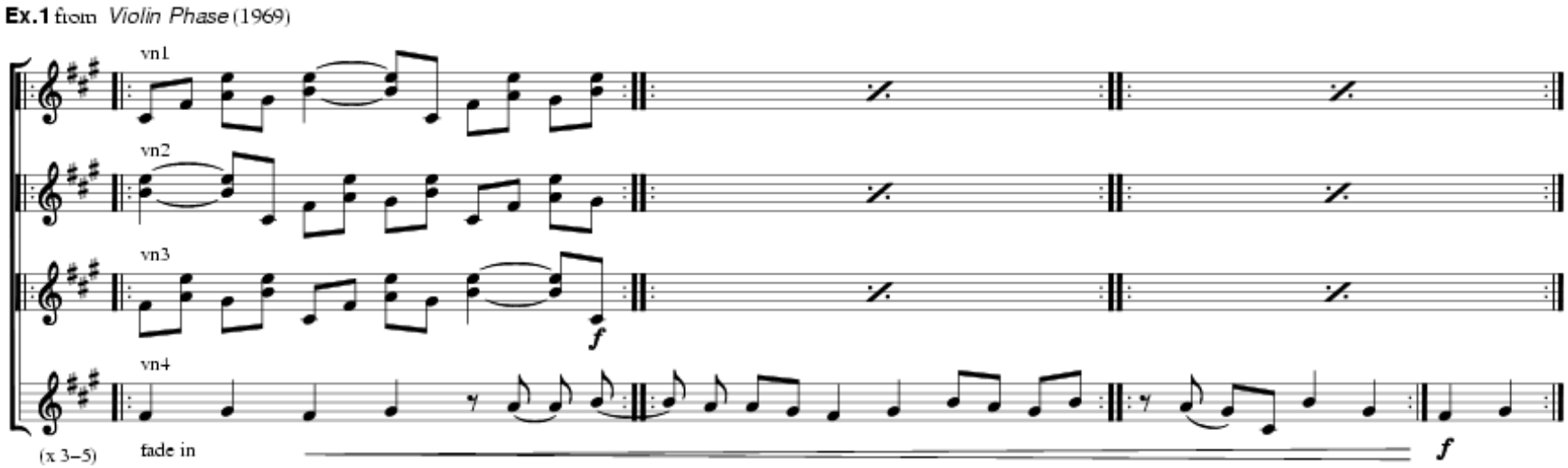
- Continues on to Mills College in California, earning a master's degree in composition while studying with Luciano Berio and Darius Milhaud (1961-63).
- Settles in San Francisco and writes first acknowledged work, *It's Gonna Rain*, in 1965.
- Piece demonstrates what would become primary traits of Reich's music: short repeating patterns and stationary harmony. Introduces notion of phasing, where rhythmic patterns move in and out of phase.
- Using recordings of an end-of-the-world sermon by a black Pentecostal street-preacher known as Brother Walter, work features two recording tapes which move in and out of phase.
- Reich influenced by minimalist composer Terry Riley as well as the music of John Coltrane and African drumming.

Reich on Phasing

Phase really has to do with the canon ... I picked it up mostly from some of the simpler piano pieces in Bartók's "Mikrokosmos" ... In my early tape pieces "It's Gonna Rain" and "Come Out," you have one tape loop going and another identical loop slipping slightly behind the first one, and what you really have is a unison canon or round where the rhythmic interval between the first and second voices is variable and constantly changing. "Phase" was just a technical word I used at the time to refer to the function of the tape recorders.

From an interview with Steve Reich by Jonathan Cott, 1996.

Excerpt from *Violin Phase*



- Note there is no time signature. If the quarter note got the beat, it would be in $\frac{6}{4}$; if the eighth note, $\frac{12}{8}$.
- The second violin is two beats ahead of the first.
- The third violin is two beats ahead of the second (or two behind the first). The group structure is $\mathbb{Z}_3$ (cyclic group of order 3).
- The phase shifting of each part makes it difficult for the listener to discern the start of the measure.

The Phase Shift

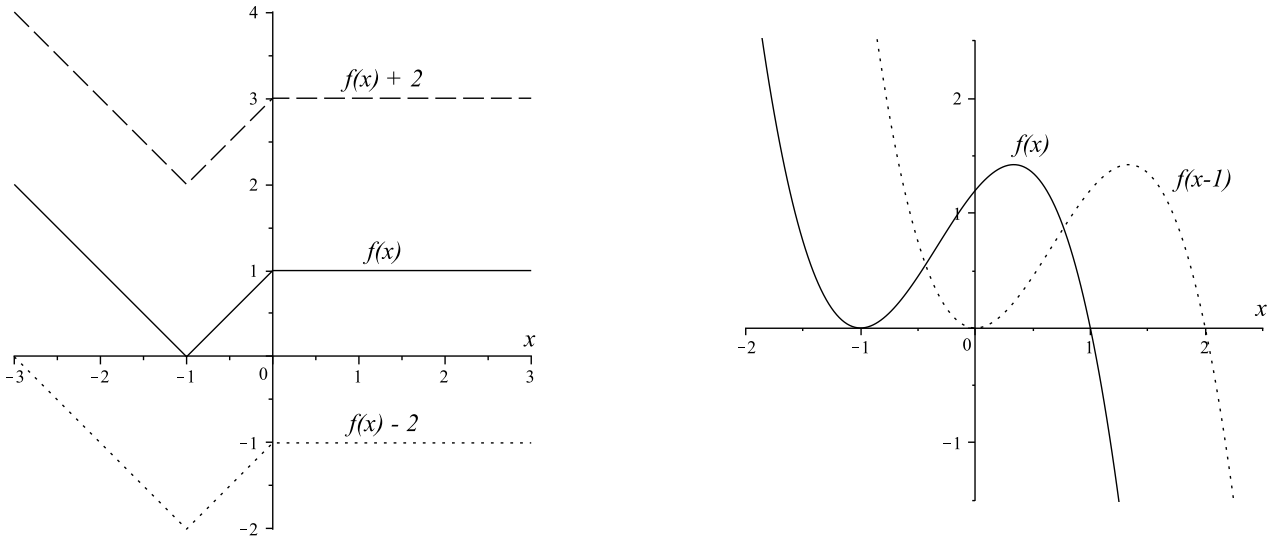
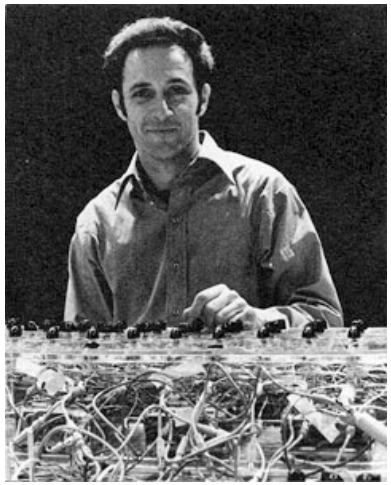


Figure: Some vertical shifts of $f(x)$ (*left*) and a horizontal shift (*right*).

Shifting graph vertically $\iff$ Transposition (shifting notes up or down)

Shifting graph horizontally $\iff$ "Phasing" (same parts entering at different times). Recall the phase shift from trigonometry (e.g., $y = \sin(t - \pi)$).

Steve Reich: Early Years



- In 1966, creates his own ensemble *Steve Reich and Musicians* which starts small (3 members) but soon grows to 18 plus. For many years, this is the only ensemble allowed to perform his pieces (doesn't publish anything until mid-1970's).

- Initially performs in museum halls and art galleries instead of concert halls (e.g., Guggenheim Museum in New York).

Steve Reich: Instant Fame

- Upon encouragement by the well-known conductor Michael Tilson Thomas, agrees to have his piece *Four Organs* (1970) performed as part of a BSO series of "new music." Performance in Carnegie Hall leads to mass chaos — head-banging, heckling, booing.
  Reich instantly becomes famous!

- Continues to explore his phasing ideas, emphasizing rhythmic pulsation, repetitive patterns and slight harmonic changes. His music is soon classified as minimalist (e.g., Philip Glass). Small changes or gradual shifts that appear simple actually lead to quite sophisticated and clever compositions.

- Wins Grammy awards in 1990 for *Different Trains* (1988) and in 1999 for *Music for 18 Musicians* (1974-76).

- Wins Polar Music Prize in 2007 and the Pulitzer Prize for Music in 2009 for *Double Sextet*.

Some Opinions of Reich

- *"He didn't reinvent the wheel so much as he showed us a new way to ride."* – John Adams, 1997, taken from the liner notes to the CD collection Steve Reich: Works 1965 - 95.

- *"My estimation of his music was greatly enhanced soon after when I heard 'It's Gonna Rain' and 'Violin Phase.' The pieces were long, witty, spiritual, swinging; and best of all, the notes were great. Hearing those first instrumental pieces was joy like that of hearing Monteverdi, Pérotin, or James Brown for the first time. It was amazing that someone could be discovering so much music with such economy of means. There was something streetwise and at the same time enormously innocent about it."* – Michael Tilson Thomas, 1997, taken from the same liner notes as above.

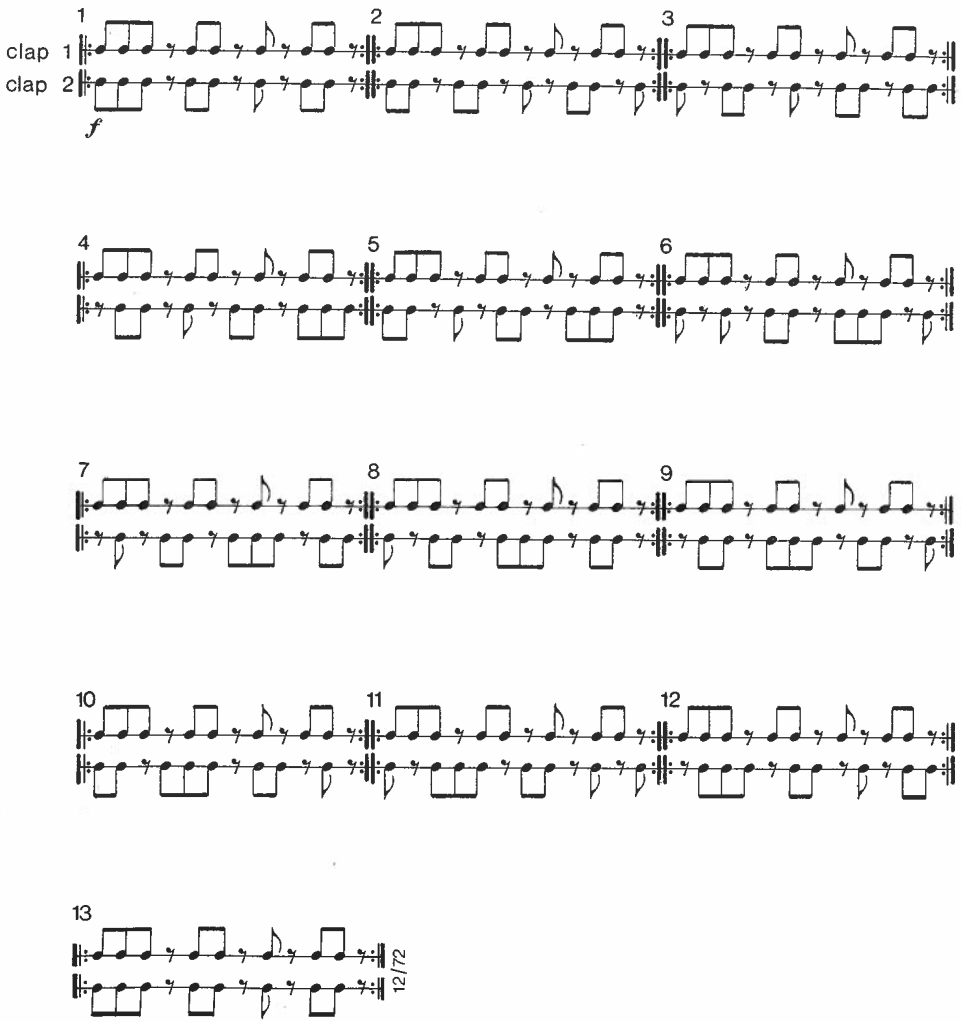
- *"America's greatest living composer"* – music critic Kyle Gann, *The Village Voice*, July 13, 1999.

clapping music

for two performers

steve reich

♩ = 160-184 Repeat each bar 12 times/Répétez chaque mesure 12 fois/Jeden takt zwölfmal wiederholen



Clapping Music (1972): Directions for Performance

Directions for Performance

The number of repeats is fixed at 12 repeats per bar. The duration of the piece should be approximately 5 minutes. The second performer should keep his or her downbeat where it is written, on the first beat of each measure and not on the first beat of the group of three claps, so that the downbeat always falls on a new beat of the unchanging pattern. No other accents should be made. It is for this reason that a time signature of 6/4 or 12/8 is not given – to avoid metrical accents. To begin the piece one player may set the tempo by counting quietly; "one, two, three, four, five, six".

The choice of a particular clapping sound, i.e. with cupped or flat hands, is left up to the performers. Whichever timbre is chosen, both performers should try and get the same one so that their two parts will blend to produce one overall resulting pattern.

In a hall holding 200 people or more the clapping should be amplified with either a single omni-directional microphone for both performers, or two directional microphones; one for each performer. In either case the amplification should be mixed into mono and both parts fed equally to all loudspeakers. In smaller live rooms the piece may be performed without amplification. In either case the performers should perform while standing as close to one another as possible so as to hear each other well.

Note the attention to detail: length of piece, lack of meter, placement of accents, importance of unified clapping timbre, instructions for electronic amplification, location of performers, etc.

Clapping Music (1972): Analysis

- Player 1 repeats the same rhythmic pattern (3+2+1+2) throughout. This is a variation of a fundamental African bell pattern – Reich had studied in drumming in Ghana in 1970.

- Player 2 starts in unison but then shifts the same pattern cyclically to the left by one eighth note. Group structure is $\mathbb{Z}_{12}$, the cyclic group of order 12. Note the retrograde-inversion in Bar 4!

- Mathematically speaking, each new measure is a horizontal translation of the original pattern, a phase shift. If $f(x)$ represents the opening pattern, then the second clapper plays $f(x+1)$ in the next measure, $f(x+2)$ in the next, and so on.

- At the final measure, we have $f(x+12) = f(x)$, so that clapper 2 has returned to the opening pattern. This is the notion of periodicity (e.g., trig functions like $\sin x$ or $\cos x$).

Clapping Music (1972): Analysis (cont.)

- Players move in and out of phase depending on how the original and shifted pattern match up. By starting with a fairly asymmetric rhythmic figure, Reich is able to create a variety of patterns and structures. Once again, a composer has created much music from a small motif (Bach, Beethoven, Bartók, Haydn, etc.)

- (Joel Haack) There are 105 possible rhythmic patterns that contain four rests and eight claps, with no consecutive rests allowed. Of these, Reich's 3, 2, 1, 2 pattern is one of only two possibilities that lead to 12 distinct measures and a non-repeating number of claps (e.g., 5, 1, 1, 1). Reich's syncopated pattern is especially unique.

- Note the lack of time signature, a feature common to many of Reich's pieces.

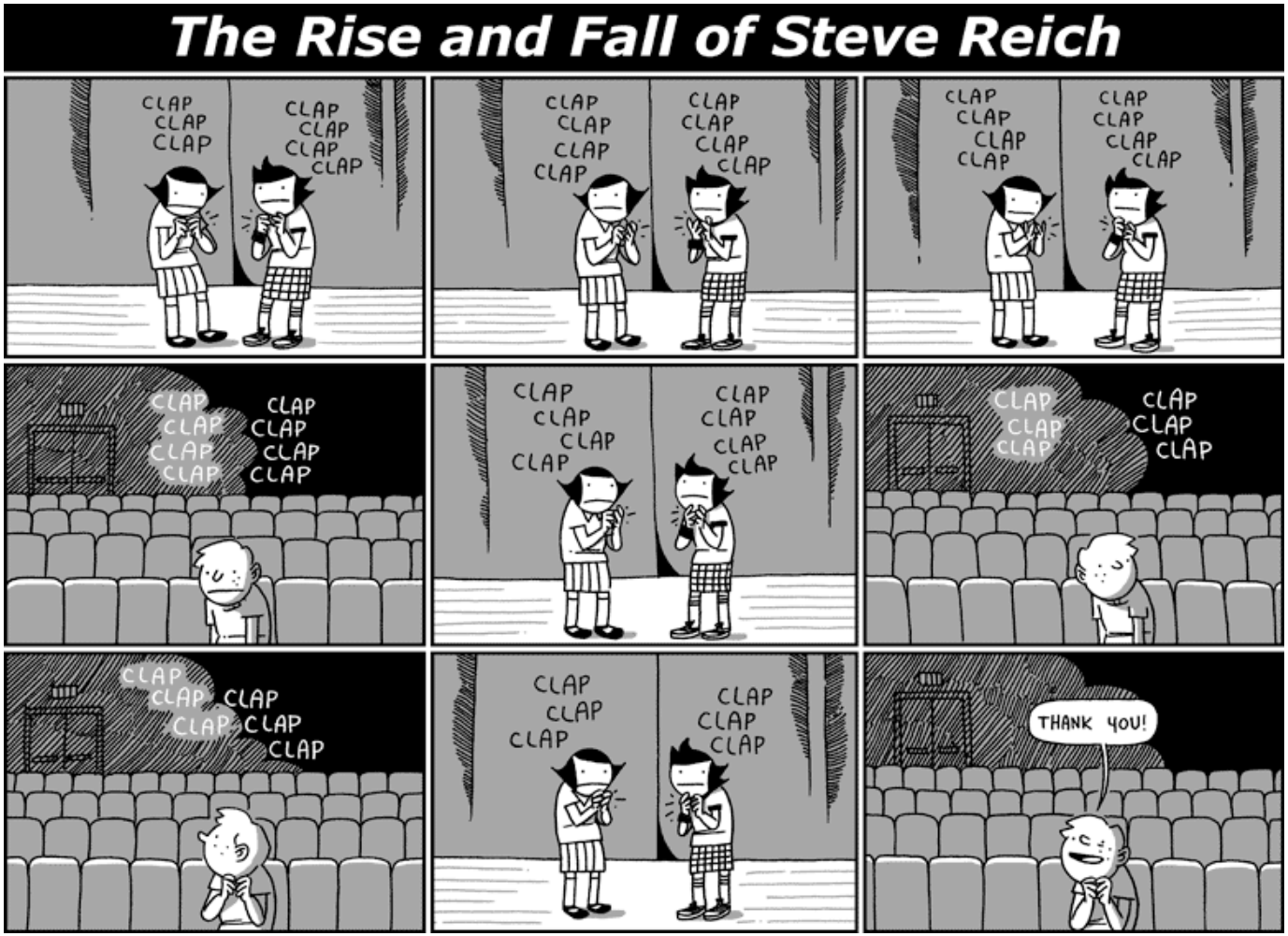
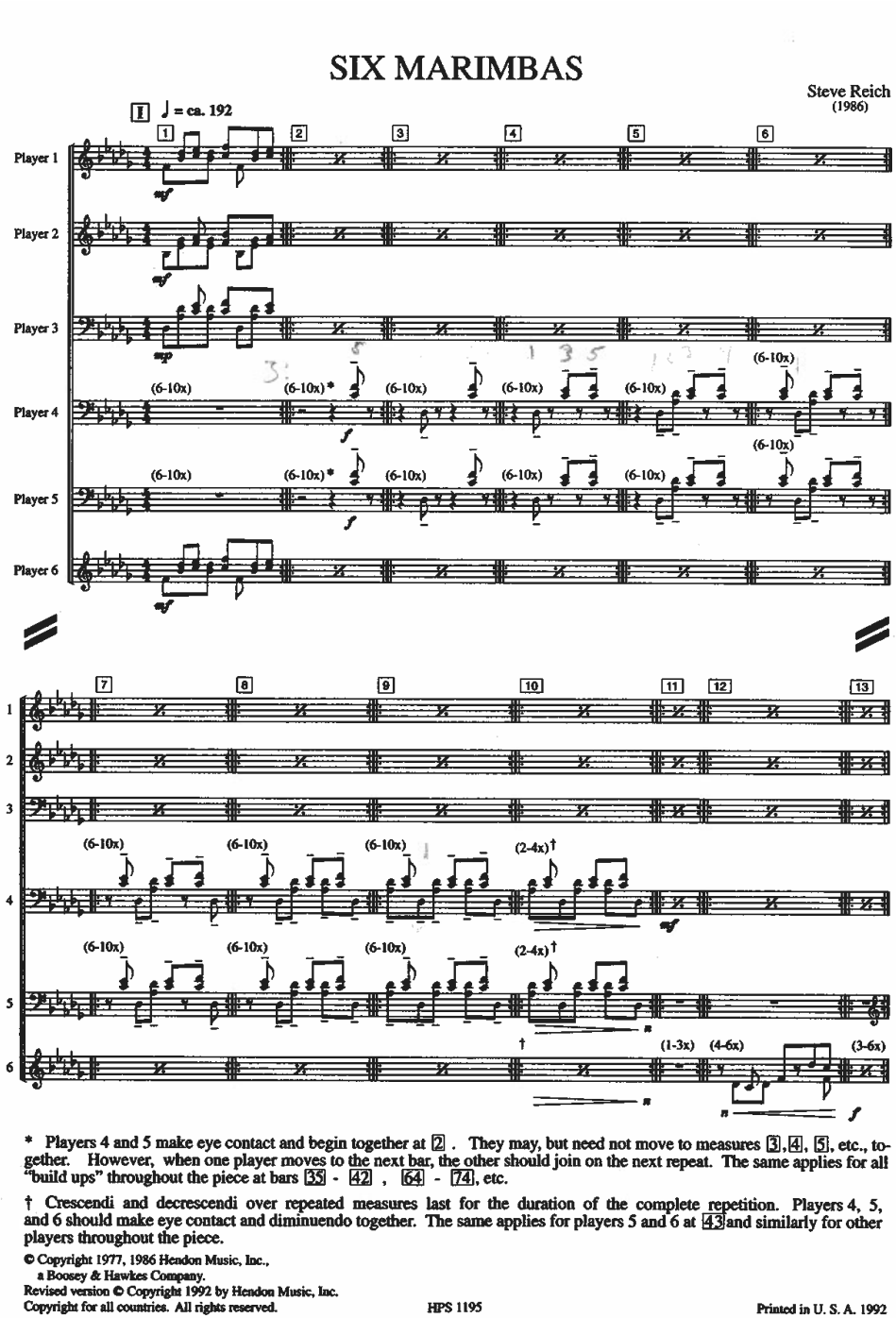
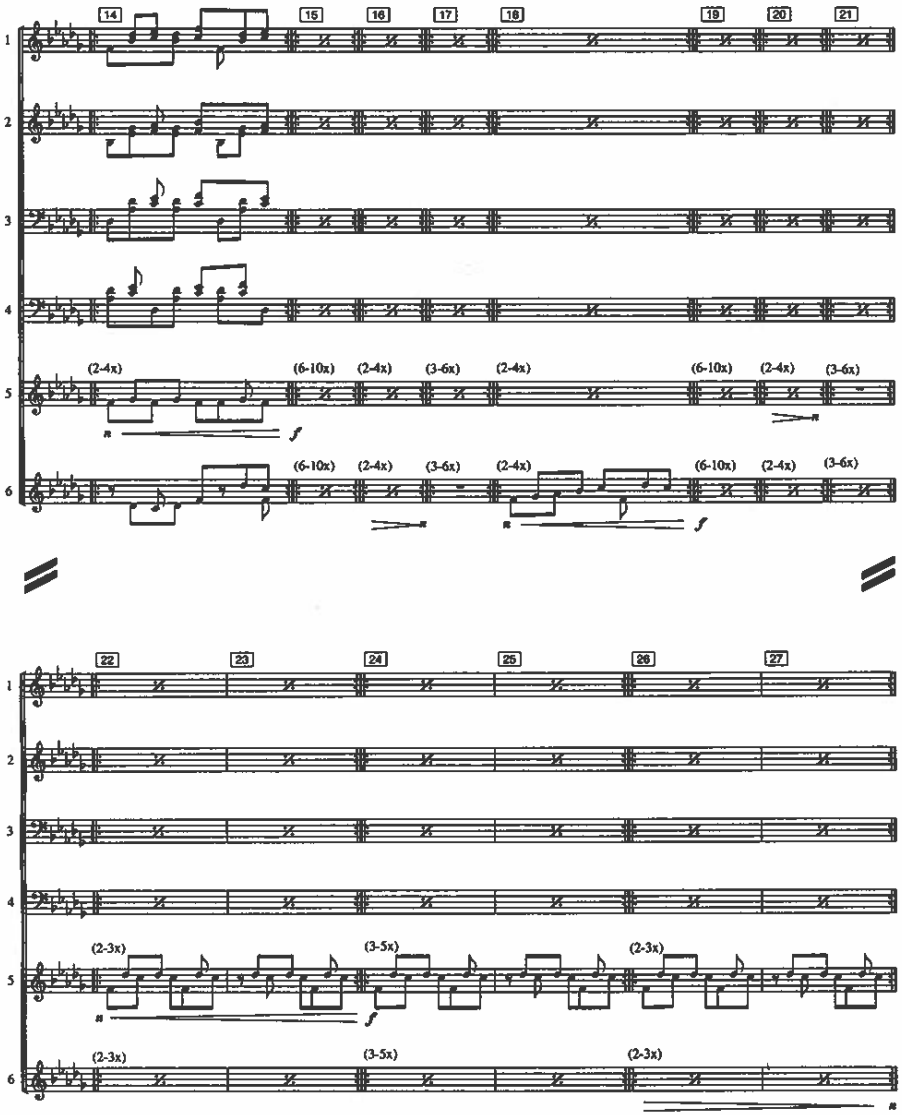
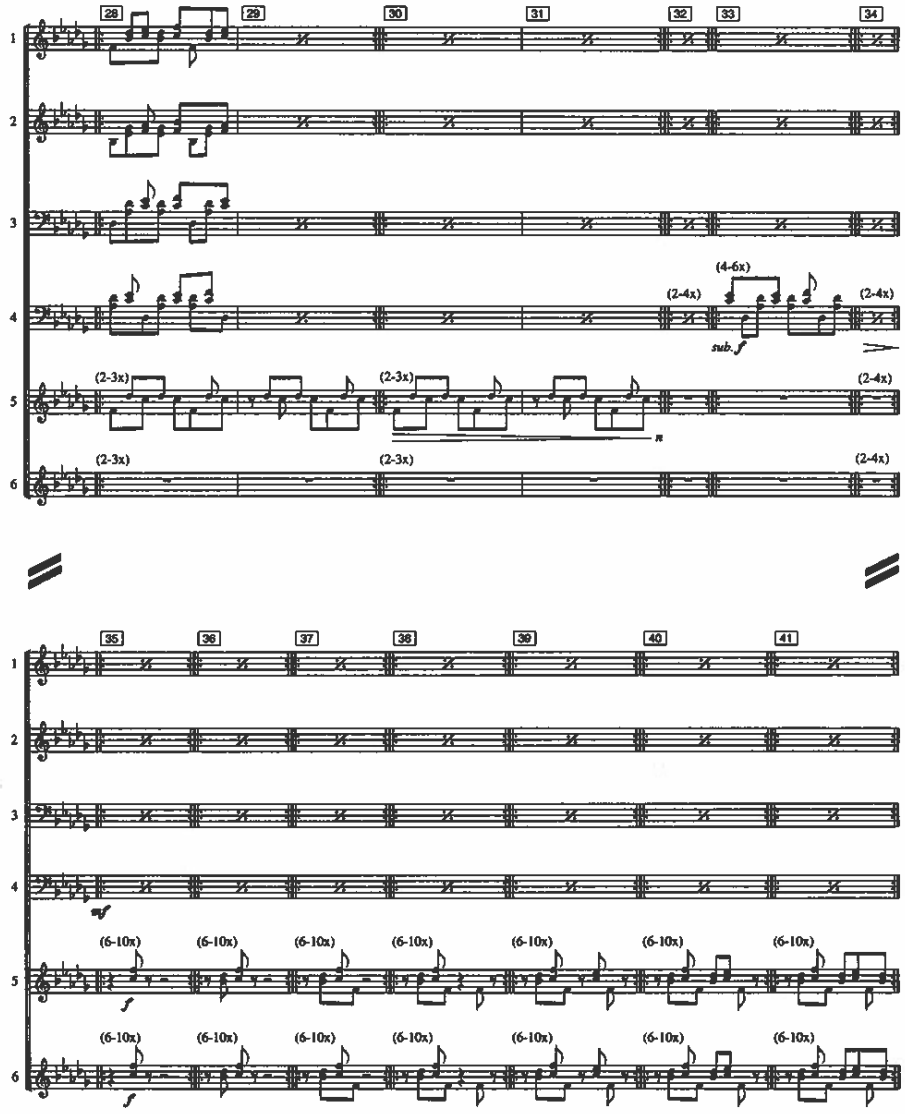


Figure: Source: `http://catandgirl.com/?p=1992`


SIX MARIMBAS
Steve Reich
(1986)
I ♩ = ca. 192
Player 1
Player 2
Player 3
Player 4
Player 5
Player 6
(6-10x)
(6-10x)*
(2-4x)†
(1-3x)
(4-6x)
(3-6x)
* Players 4 and 5 make eye contact and begin together at 2 . They may, but need not move to measures 3, 4, 5, etc., together. However, when one player moves to the next bar, the other should join on the next repeat. The same applies for all "build ups" throughout the piece at bars 35 - 42 , 64 - 74, etc.
† Crescendi and decrescendi over repeated measures last for the duration of the complete repetition. Players 4, 5, and 6 should make eye contact and diminuendo together. The same applies for players 5 and 6 at 43 and similarly for other players throughout the piece.
© Copyright 1977, 1986 Hendon Music, Inc.,
a Boosey & Hawkes Company.
Revised version © Copyright 1992 by Hendon Music, Inc.
Copyright for all countries. All rights reserved.
HPS 1195
Printed in U. S. A. 1992


2
14 15 16 17 18 19 20 21
(2-4x) (6-10x) (2-4x) (3-6x) (2-4x) (6-10x) (2-4x) (3-6x)
(6-10x) (2-4x) (3-6x) (2-4x) (6-10x) (2-4x) (3-6x)
22 23 24 25 26 27
(2-3x) (3-5x) (2-3x)
(2-3x) (3-5x) (2-3x)


3
28 29 30 31 32 33 34
(4-6x)
(2-4x) (2-4x)
sub. f
(2-3x) (2-3x) (2-4x)
(2-3x) (2-3x) (2-4x)
35 36 37 38 39 40 41
(6-10x) (6-10x) (6-10x) (6-10x) (6-10x) (6-10x) (6-10x)
(6-10x) (6-10x) (6-10x) (6-10x) (6-10x) (6-10x) (6-10x)

The Marimba

Six Marimbas, 1986

- Piece is a rescoring for marimbas of Reich's 1973 composition *Six Pianos*. The marimbas provide a more gentle (hypnotic?) sound and are more practical than pianos.
- Four marimbas start playing an identical eight-beat rhythmic pattern on different notes in D♭ major. ▸ Six Marimbas
- The other two marimbas then enter, at first playing only one beat per measure, then two, then three and so on until they are playing the same rhythmic pattern. However, the players shift the pattern at the outset (phasing), moving it forward two beats (a right shift).
- Once this rhythmic canon is complete, other players begin to accentuate interesting melodic features of the original quartet.
- Piece is structured into three sections with the first in D♭ major, the second in E♭ dorian and the third in B♭ natural minor, although this is hard to notice because of how gradual the changes occur.

Philip Glass and Minimalism

- Born in 1937. Grew up in Baltimore and studied at University of Chicago, the Juliard School, and in Aspen with Darius Milhaud. Moved to Europe to study with Boulanger and sitar star Ravi Shankar. Returned to NYC in 1967 and formed the Philip Glass Ensemble.

- Famous for the musical style of minimalism, though he disliked the term and preferred to be thought of as a composer of "music with repetitive structures."

- Tremendous output and variety of music: 20 operas, 10 symphonies, two piano concertos, string quartets, solo piano and organ works, numerous film soundtracks ("The Hours," Martin Scorsese's "Kundun," "The Truman Show").

- Collaborated with Paul Simon, Linda Ronstadt, Yo-Yo Ma, and Doris Lessing

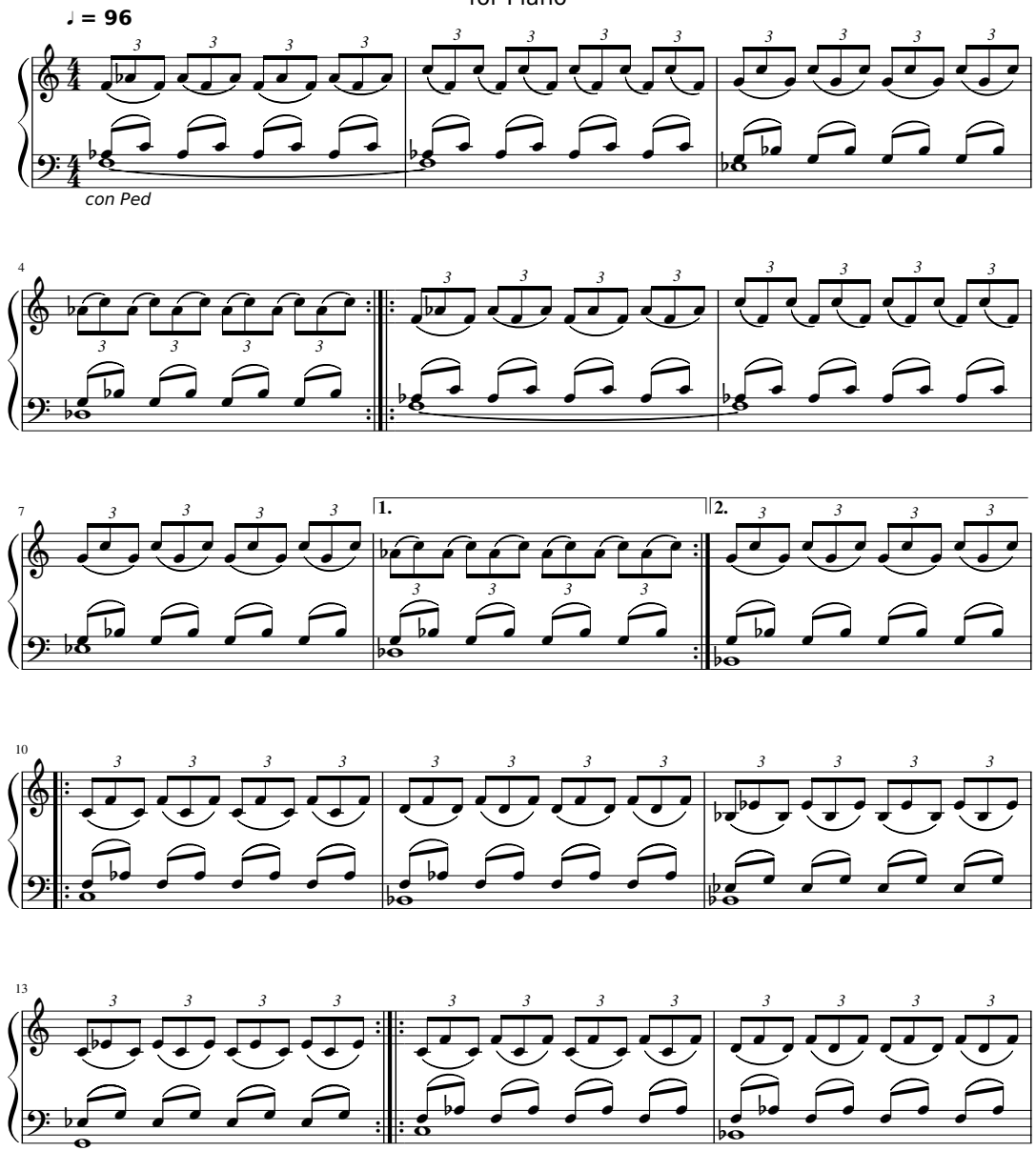
NO.1

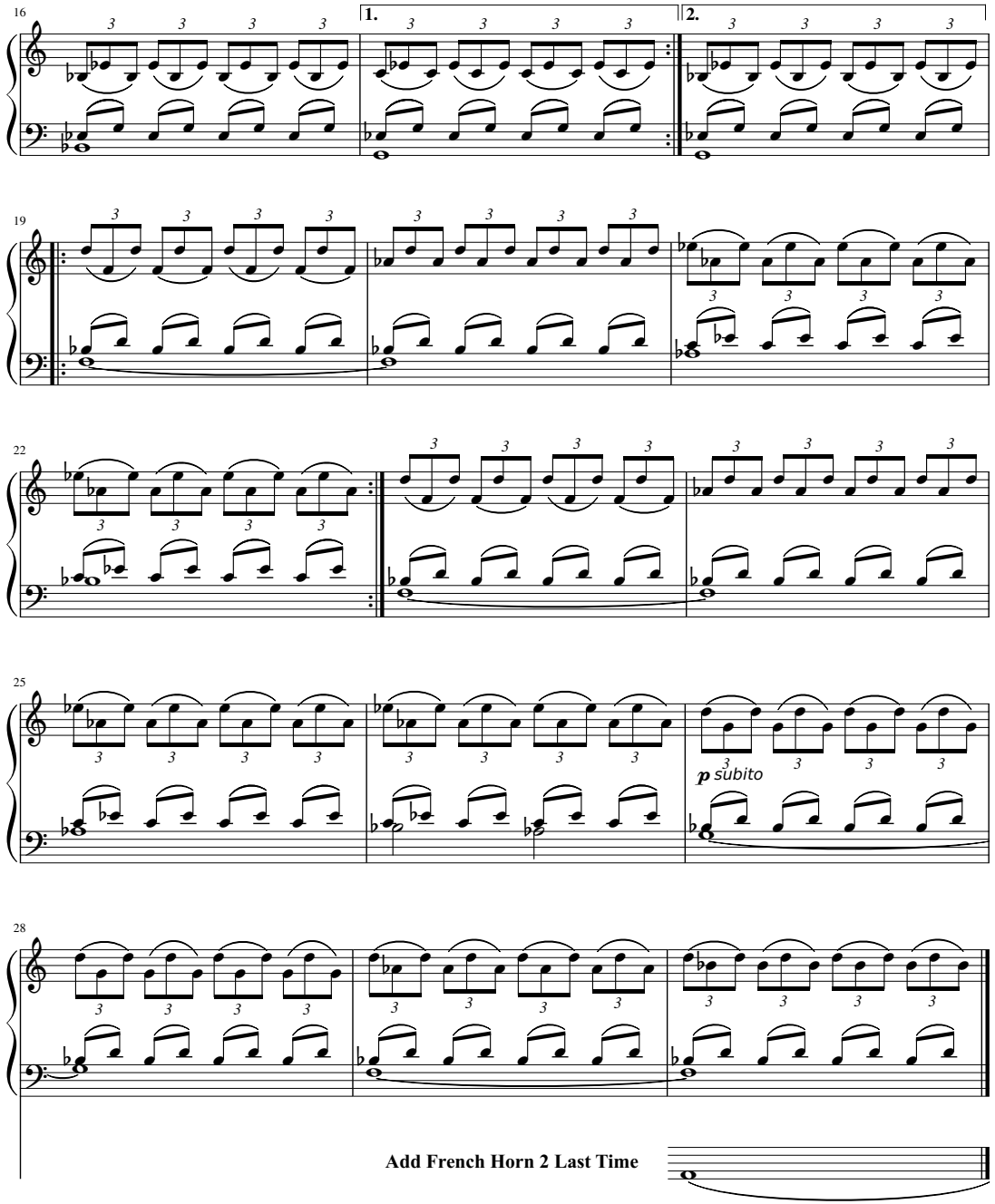
Opening

for Piano

Concert Score

Philip Glass




16
1.
2.
19
22
25
p subito
28
Add French Horn 2 Last Time