

Explorations in Notation

Contemporary Notational Types

- Symbolic notation
- Improvisational notation
- Graphic notation

- Metric notation
- Proportional (spatial) notation:
 - Time represented spatially, rather than symbolically.
 - Durations may be general or specific, represented by regular tick marks, bracketed timing indications, or a pre-defined temporal-spatial relationship.
 - Some degree of “standard” (symbolic) notation may be incorporated, but is usually modified in some way.
 - Many of these notational innovations have already been codified (see Kurt Stone, *Music Notation in the Twentieth Century*).

Three Notations of a Medieval Chant

In Neumatic notation
(8th-14th centuries):

XI. c.

5. **S** Anctus, * Sánc-tus, Sán-ctus Dóminus Dé- us

Sá- ba-oth. Plé-ni sunt caé- li et tér-ra gló-ri- a

In Modern notation
(17th century-present):

XI. s.

5. San- ctus, * San- ctus, San- ctus Dó-mi-nus

De- us Sá- ba- oth. Ple-ni sunt cæ- li

In “stemless” notation
(late 20th century):

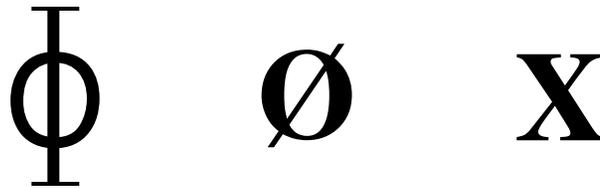
5. San - ctus, * San - ctus, San - ctus

Dó-mi-nus De - us Sá - - ba - oth. Ple - ni sunt

Proportional (Spatial) Notation

Representing duration in proportional notation

- *Senza misura* (spatially notated sections) represented by a distinct time signature, which may be notated in several ways:



- Durational continuum (values arranged from shortest to longest):



- Rests may be represented by empty space and/or “breath marks”:



- Accelerando/ritardando groupings represented by “feathered beaming”; as fast as possible represented by slash through beamed group:



Proportional (Spatial) Notation

Joseph Klein: *Der Ohrenzeuge*, for solo bass flute (2001):

CODA:

51a

51b

The image shows two staves of musical notation for a solo bass flute. Staff 51a is in treble clef with a common time signature. It features a series of notes with dynamic markings: *p* *suave*, *mf*, *mp*, and *f*. There are also markings for *(o.v.)*, *mp sub.*, and *f.v.* with arrows indicating a transition. Staff 51b is also in treble clef. It starts with *f* *o.v. sub.*, followed by *mp* *n.v.*, *mf* *poco*, and *p* *n.v.*. There are also markings for *lunga* and *poco* with arrows indicating a transition.

Joseph Klein: *Die Müde*, for solo alto saxophone (2004)

The image shows a single staff of musical notation for a solo alto saxophone. It features a series of notes with dynamic markings: *n*, *mp*, and *mp*. There are also markings for *n.v.* and *poco* with arrows indicating a transition.

Luciano Berio: *Sequenza I* (1958)

A. Original (proportional) notation:

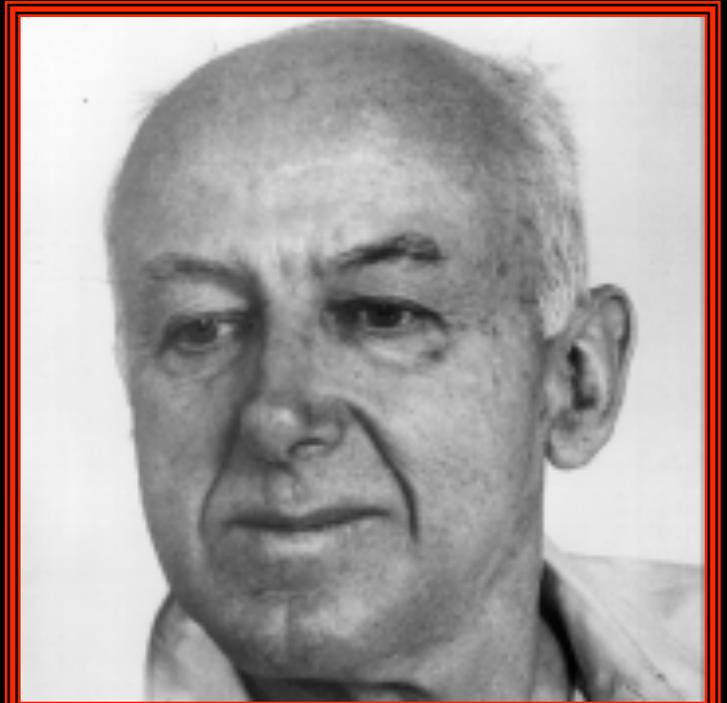
The image shows two staves of musical notation for Luciano Berio's *Sequenza I*. The top staff begins with a tempo marking of 70 M.M. and dynamic markings of *sfz*, *ff*, *ff*, *mf*, *ff > mf*, and *p*. The bottom staff continues with *ff*, *sfz*, *mf*, *f > ff*, and *ff*. The notation is proportional, with note durations and rests varying in length to create a specific rhythmic feel.

B. The composer's transcription into metric notation:

The image shows two staves of musical notation for Luciano Berio's *Sequenza I* in metric notation. The top staff has a tempo marking of $\text{♩} = 70$ and dynamic markings of *ff sempre*, *mf*, *ff > mf*, and *p*. The bottom staff has dynamic markings of *f*, *ff*, *mf*, *f > ff*, *ff*, *ff-p*, and *ppp*. The notation is metric, with note durations and rests measured in fixed units of time. The bottom staff includes a $\Delta 5$ marking, indicating a 5-measure rest.



Henry Cowell
(1897-1965)



Henry Cowell: *The Banshee* (1925)

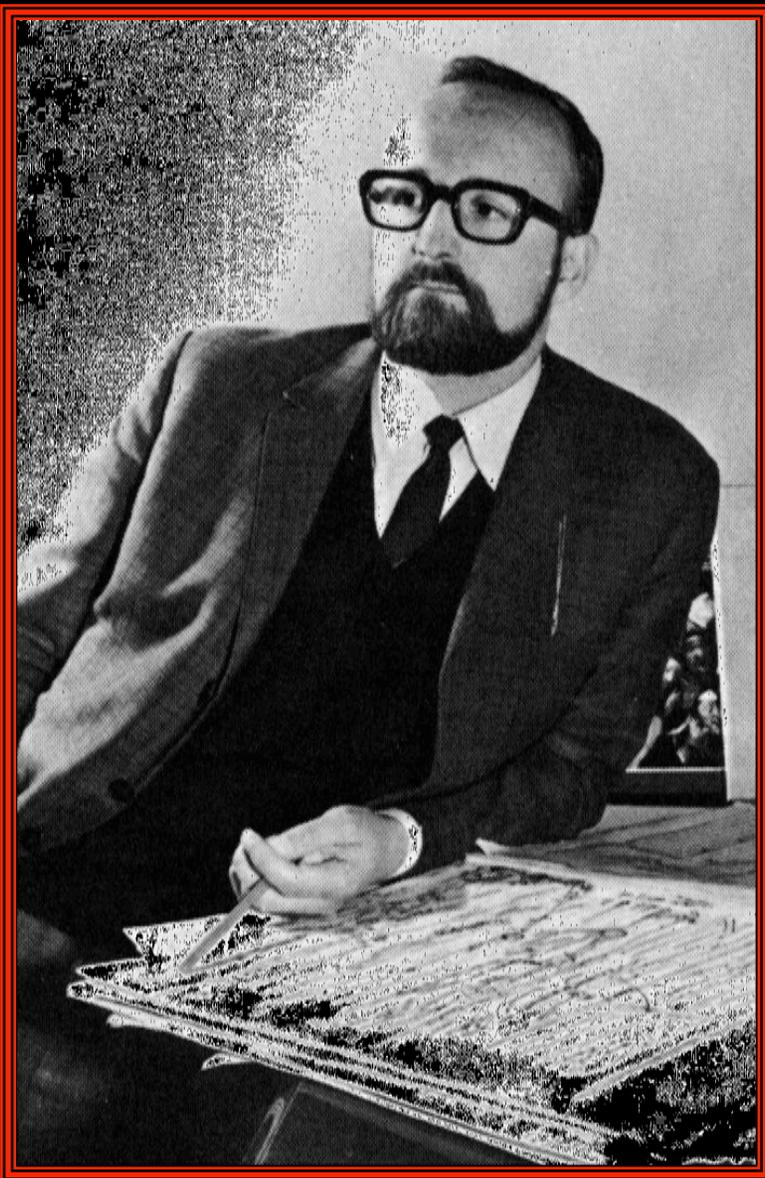
Explanation of Symbols

"The Banshee" is played on the open strings of the piano, the player standing at the crook. Another person must sit at the keyboard and hold down the damper pedal throughout the composition. The whole work should be played an octave lower than written.

R. H. stands for "right hand." L. H. stands for "left hand." Different ways of playing the strings are indicated by a letter over each tone, as follows:

- (A) indicates a sweep with the flesh of the finger from the lowest string up to the note given.
- (B) sweep lengthwise along the string of the note given with flesh of finger.
- (C) sweep up and back from lowest A to highest B-flat given in this composition.
- (D) pluck string with flesh of finger, where written, instead of octave lower.
- (E) sweep along three notes together, in the same manner as (B).
- (F) sweep in the manner of (B) but with the back of finger-nail instead of flesh.
- (G) when the finger is half way along the string in the manner of (F), start a sweep along the same string with the flesh of the other finger, thus partly damping the sound.
- (H) sweep back and forth in the manner of (C), but start at the same time from both above and below, crossing the sweep in the middle.
- (I) sweep along five notes, in the manner of (B).
- (J) same as (I) but with back of finger-nails instead of flesh of finger.
- (K) sweep along in manner of (J) with nails of both hands together, taking in all notes between the two outer limits given.
- (L) sweep in manner of (C) with flat of hand instead of single finger.

The musical score for "The Banshee" is presented in a single staff with a 2/2 time signature. It features a variety of string techniques indicated by letters A through L above the notes. The score is divided into several sections with different tempo markings: *Tempo Rubato*, *a tempo*, *Faster*, *Presto*, and *Slow*. Dynamics range from *pp* (pianissimo) to *ppp* (pianississimo). The score includes various articulations such as *pizz.* (pizzicato), *naïl* (nail), and *rit.* (ritardando). The piece concludes with a *ppp* dynamic marking.



Krzysztof Penderecki (b. 1933)

Background & Musical Characteristics

- Born in Krakow, Poland.
- Exposure to contemporary music limited during his youth, due to restrictive Soviet culture.
- *Threnody—for the Victims of Hiroshima* (1960) was his breakthrough work, reflecting the influence of electronic music through purely acoustic means.
- “Soundmass” works from the 1960s distinguished by their use of color and texture, as well as innovative notation.
- Religious (specifically, Catholic) and political themes permeate his work.
- Work during the 1970s reflects a change in direction, combining his unique approach to texture/timbre with an increasing interest in tonality.
- During the 1980s, his work became unabashedly tonal.

Krzysztof Penderecki: *Threnody for the Victims of Hiroshima* (1960)

Abbreviations and Symbols

ord.
s. p.
s. t.
c. l.
l. batt.

raised by $\frac{1}{4}$ tone



raised by $\frac{3}{4}$ tone



lowered by $\frac{1}{4}$ tone



lowered by $\frac{3}{4}$ tone



highest note of the instrument (indefinite pitch)



play between bridge and tailpiece



arpeggio on 4 strings behind the bridge



play on tailpiece (arco)



play on bridge



percussion effect: strike the upper sounding board of the violin with the nut or the finger-tips



several irregular changes of bow



molto vibrato



very slow vibrato with a $\frac{1}{4}$ tone frequency difference produced by sliding the finger



very rapid not rhythmicized tremolo



Krzysztof Penderecki: *Threnody for the Victims of Hiroshima* (1960)

Detail from Score

The image shows a detail from the score for the string section of Krzysztof Penderecki's *Threnody for the Victims of Hiroshima*. The score is divided into three parts by vertical dashed lines. The first part (measures 17-20) features various dynamics and articulations: *s.p.* (sordido), *arco*, *pp*, *ff*, and *pizz.* (pizzicato). The second part (measures 4-6) includes *p*, *ppp*, and *f*. The third part (measures 4-6) is marked *ff sempre* and *pizz.*. The string groups are labeled on the left: 4 Vn (Violins), 3 VI (Violas), 3 Vc (Violas), and 2 Cb (Cellos). The score includes various musical notations such as slurs, accents, and dynamic markings.

Krzysztof Penderecki: *Threnody for the Victims of Hiroshima* (1960)

Detail from Score

The image shows a detail from a musical score for two parts: 10Vc (Violins) and 8Cb (Cellos). The 10Vc part is shown in two staves, with a red dashed box highlighting the melodic lines. The 8Cb part is shown in two staves, with a red dashed box highlighting the melodic lines. A blue dashed box highlights a specific section of the 10Vc part, labeled "1-10", with annotations "tutti s.p." and "pp". A blue dashed box highlights a specific section of the 8Cb part, labeled "1-8", with annotations "tutti" and "ppp". A blue line points from the 10Vc section to a blue dashed box labeled "Resulting pitch band", which shows a dark, bell-shaped curve representing the pitch range. A red line points from the 8Cb section to a red dashed box labeled "Trajectories of outer parts", which shows the melodic lines of the 8Cb part. The score is written in treble clef for the 10Vc and bass clef for the 8Cb. The tempo is marked "s.p." (sempre più) and the dynamics are "pp" (pianissimo) and "ppp" (pianississimo).

Krzysztof Penderecki: *Threnody for the Victims of Hiroshima* (1960)

The musical score is organized into three time segments: 15'', 25'', and 20''. The instruments are grouped as follows:

- 15'' segment:**
 - 10VI:** Six staves, mostly empty.
 - 10Vc:** Two staves. Part 1 (1-10) is marked *tutti s.p.* *pp*. Part 2 (10) is marked *pp*.
 - 8Cb:** Three staves. Part 1 (1-8) is marked *tutti* *ppp*. Part 2 (8) is marked *ppp*.
- 25'' segment:**
 - 10VI:** Six staves. Part 1 (1-12) is marked *metá s.p.* *ppp*. Part 2 (12) is marked *ppp*.
 - 10Vc:** Two staves. Part 1 (1) is marked *ppp*. Part 2 (12) is marked *ppp*.
- 20'' segment:**
 - 10VI:** Six staves. Part 1 (1-10) is marked *tutte* *mf*. Part 2 (10) is marked *mf*.
 - 10Vc:** Two staves. Part 1 (13-24) is marked *con sord. metá* *ppp*. Part 2 (24) is marked *ppp*.
 - 8Cb:** Three staves. Part 1 (13-24) is marked *con sord. metá* *ppp*. Part 2 (24) is marked *ppp*.

* Exact notation is given in the parts.

Krzysztof Penderecki: *Threnody for the Victims of Hiroshima* (1960)

The image displays a page of a musical score for Krzysztof Penderecki's *Threnody for the Victims of Hiroshima*. The score is organized into two main sections, marked with circled numbers 13 and 15. The instruments are arranged vertically: 24 Vn (Violins), 10 VI (Violas), 10 Vc (Violas), and 8 Cb (Cellos). The score includes various performance instructions such as *ord.* (order), *p* (piano), *f* (forte), *ppp* (pianissimo), *con sord.* (with mutes), and *senza sord.* (without mutes). The measures are numbered 13-12, 13-24, 1-10, 1-10, 1-10, and 1-8. The bottom of the page indicates the measure numbers 15", 20", and 10".

Krzysztof Penderecki: *Threnody for the Victims of Hiroshima* (1960)

16

12Vn

12Vn

10VI

10Vc

8Cb

18"

20"

*) flageolet tones



Toru Takemitsu: *Rain Spell* (1983)

A Freely, very spatially.

Piano
pp, p, sfz, poco mf, sfz

Harp
pp, Mit, sfz, p, bisbigliando, pp sempre, Do! Sol! poco f, (pp), Eolian rustling

Vibraphone
(medium hard mallets), Motor on pp sempre

Flute
ppp

Clarinet (in B \flat) (Transposed)

Toru Takemitsu: *Rain Spell* (1983)

The score is arranged for five instruments: Piano (Pf.), Harp (Hrp.), Vibraphone (Vib.), Flute (Fl.), and Clarinet (Cla.).

- Piano (Pf.):** Starts with *pp* and *lv.* (lento vivace). A *Mute* instruction is placed above the staff. The dynamic shifts to *poco f/z*.
- Harp (Hrp.):** Features a glissando marked *gliss.* and *mf*. Notes are labeled with solfège: (Sol, Ré) and (Si, La). A *ppp* dynamic is indicated at the end of the section.
- Vibraphone (Vib.):** Includes a *PF* (Percussion) box and a *FL* (Flute) box. A *ppp* dynamic is also present.
- Flute (Fl.):** Starts with *p* and *longer*. A *rapidly* section is marked with *f* and *pp*. The tempo is marked *molto*. A *f* dynamic is shown at the end.
- Clarinet (Cla.):** Remains silent throughout this section.

Vertical dashed lines and boxes labeled *PF* and *FL* indicate specific performance events or cues for the Percussion and Flute parts.

Toru Takemitsu: *Rain Spell* (1983)

The musical score for *Rain Spell* (1983) by Toru Takemitsu is a five-part orchestral work. The score is written for Piano (Pf.), Harp (Hrp.), Vibraphone (Vib.), Flute (Fl.), and Clarinet (Cla.).

Piano (Pf.): The piano part begins with a dynamic of *mf*. It features a section marked "Slowly" with a tempo of *pp* and a dynamic of *mf ff*. The score includes a five-measure rest (5) and a three-measure rest (3).

Harp (Hrp.): The harp part starts with a dynamic of *p*. It includes a section marked "Eolian rustling" with a dynamic of *pp* and a section marked "bisbigliando (longer)" with a dynamic of *pp*. The score includes a six-measure rest (6) and a dynamic of *pp*. The harp part also includes a section marked "Mit, Fat" with a dynamic of *pp*.

Vibraphone (Vib.): The vibraphone part is marked with a dynamic of *pp*.

Flute (Fl.): The flute part is marked "Cantabile slowly" with a dynamic of *mf-p*. It includes a section marked *p* and a section marked *fp poco*. The score includes a dynamic of *p* and a section marked "dying away" with a dynamic of *p*.

Clarinet (Cla.): The clarinet part is marked with a dynamic of *pp* and includes a section marked "soloistic" with a dynamic of *pp*.

The score includes various performance instructions such as "ord.", "Eolian rustling", "bisbigliando (longer)", "Mit, Fat", "Cantabile slowly", "dying away", and "soloistic". It also includes dynamic markings like *mf*, *pp*, *mf ff*, *fp poco*, and *p*.

Toru Takemitsu: *Rain Spell* (1983)

B Mute

Pf. *mp* l.v.

Hrp. Do^b

Vib.

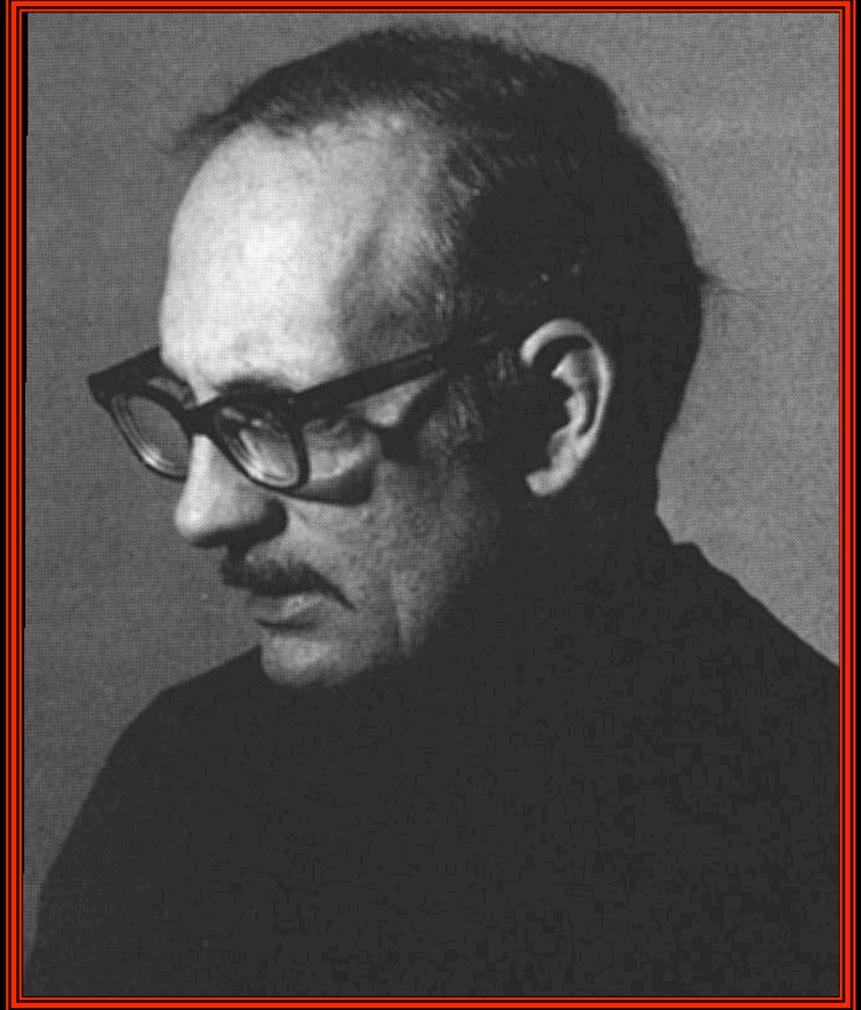
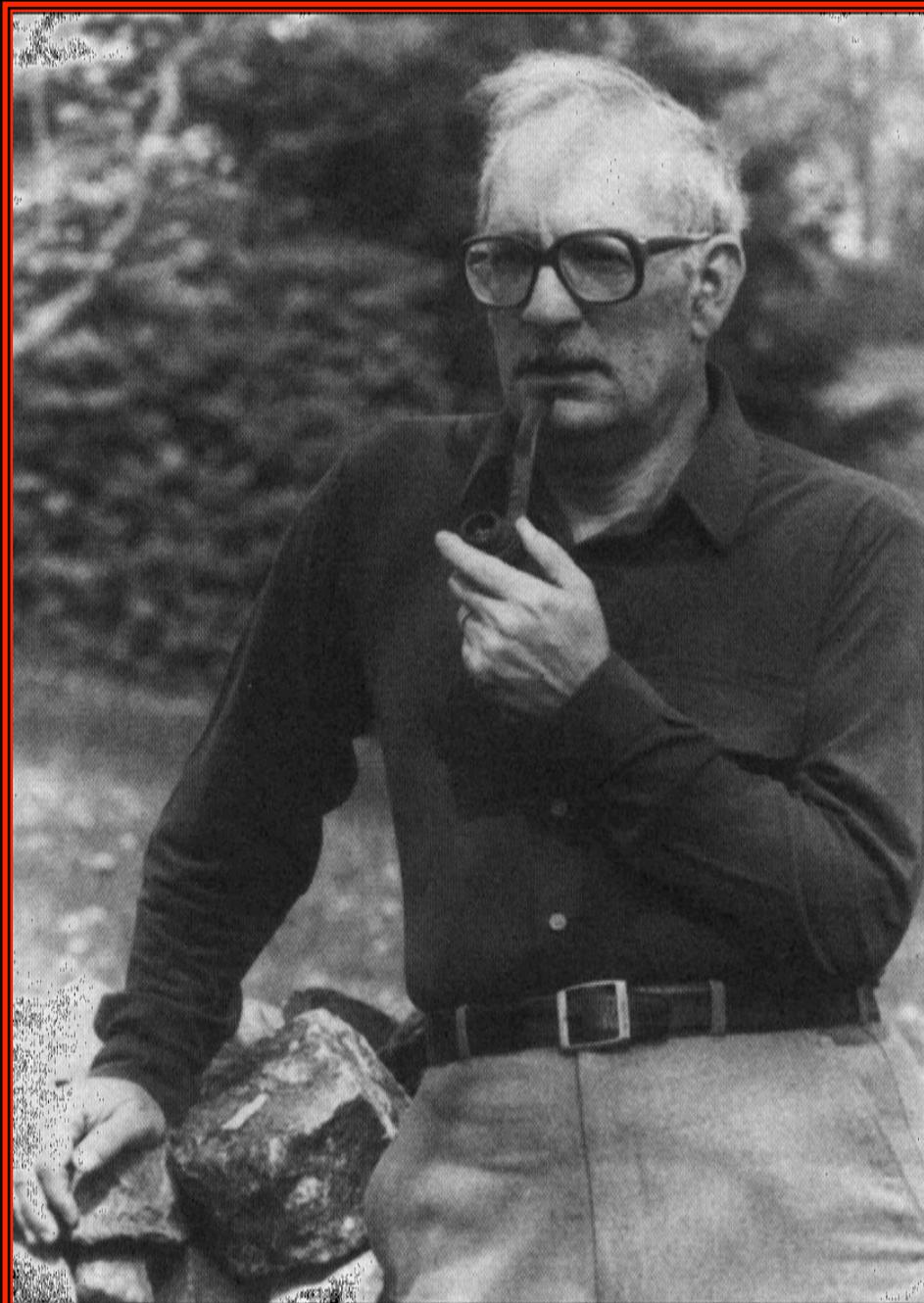
Fl.

Cl. *p* *poco mf* *Slowly* *pp* *sub. mf* *p* *rapidly* *pp* *poco* *in pp*

* T
R
D

* R means register key.

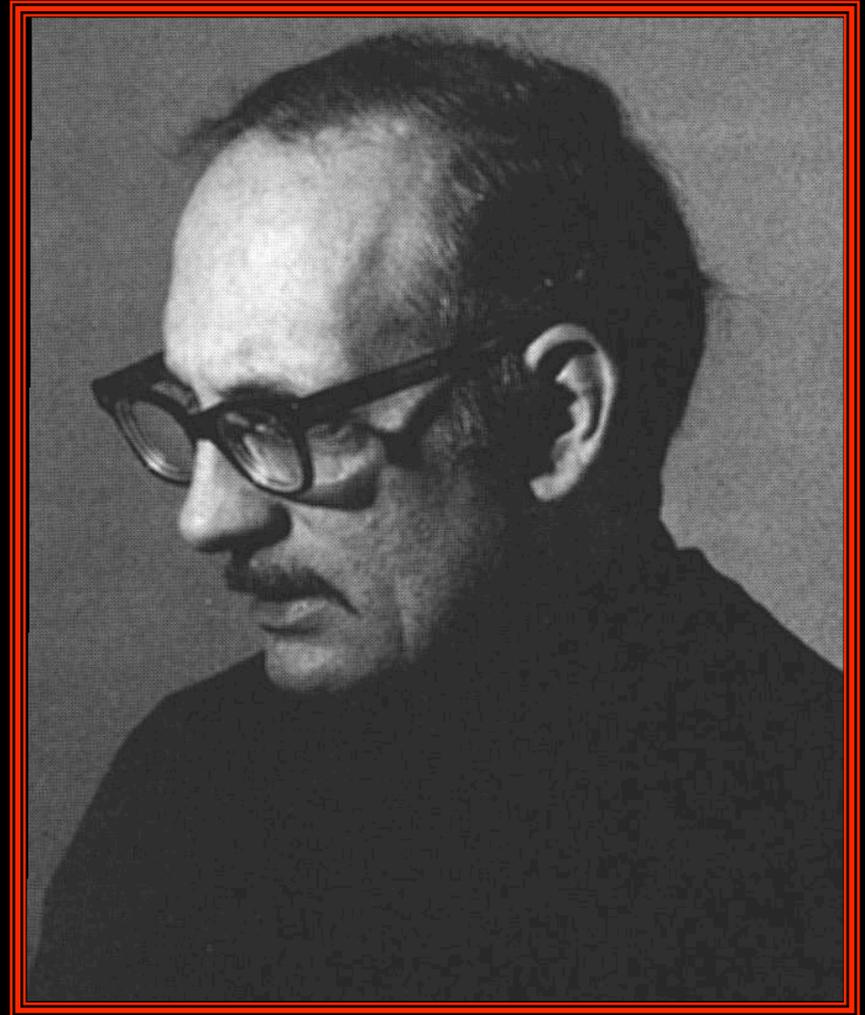




George Crumb (b. 1929)

Background & Musical Characteristics

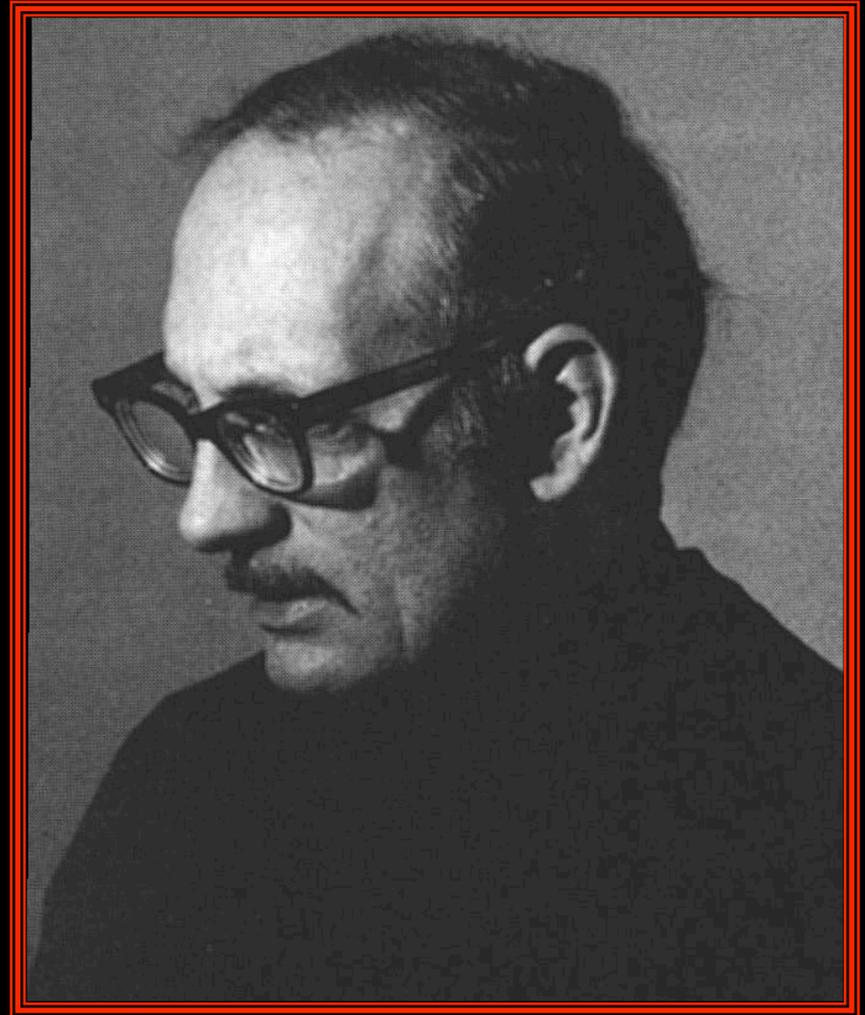
- Born in Charleston, West Virginia.
- Studied composition at the University of Michigan; taught for many years at the University of Pennsylvania (1965-1997).
- Awarded Pulitzer Prize in Music (1968) for *Echoes of Time and the River*.
- His distinctive works are characterized by:
 - Uniquely elegant and elaborate notation.
 - Instrumental and vocal exploration.
 - Effective integration of tonal and non-tonal elements.
 - Theatrical, often ritualistic approach to performance.
 - References to non-Western and historical Western music (via quotation, stylistic appropriation, and instrumentation),
 - Extramusical programs, numerology, and poetic references.



George Crumb (b. 1929)

Background & Musical Characteristics

- *Vox Balanae* (Voice of the Whale), 1970: quotation from Richard Strauss *Also Sprach Zarathustra*
- *Ancient Voices of Children*, 1970: quotation from J.S. Bach *Bist du bei Mir* (from *Notebook for Anna Magdalena Bach*)
- *Black Angels*, 1970:
 - Pavana Lachrymae (Schubert quote)
 - Devil Music (Tartini, tritone, Dies Irae)
 - Threnody II (electric insects)
 - God Music (tuned goblets)
- *Makrokosmos I-II* (1972-1974): notation influenced by "mannerism" of the *ars nova* composers (late 14th-century)



George Crumb (b. 1929)

Baude Cordier: *Belle, Bonne, Sage* (c. 1400)

M. Baude Cordier

The image displays a musical score for the song 'Belle, Bonne, Sage' by Baude Cordier, circa 1400. The score is presented in a unique, heart-shaped layout. At the top, the composer's name 'M. Baude Cordier' is written in a Gothic script. The main body of the score is a large heart shape formed by several staves of music. The lyrics are written in French and are integrated into the heart's outline. The lyrics include: 'Elle bonne sage plus fait de son', 'Le son d'une chose nouvelle', 'Le son d'un', 'qui s'ouïe si profente', 'L'no: Belle bonne', and 'Oltra Belle bonne'. Below the heart-shaped graphic, there are three more staves of music. The lyrics for these staves are: 'De recevoir ce don ne foyes lente, si vous suppli me', 'doulce femme. Belle bonne...', 'Car tant vous am q'aillez pas mon entente', 'ce st pas q'vous estes seule celle qui fame', 'mes que a'asim vous appelle. flout', 'Si beaux sur toutes queillées', and 'Belle bonne...'. The score is written in a medieval style with square notes on a four-line staff.

George Crumb: "Crucifixus" from *Makrokosmos I* (1972)

4. Crucifixus [SYMBOL] Capricorn $\text{♩} = 40$

Darkly mysterious ($\text{♩} = \text{ca. } 3 \text{ sec.}$)

come sopra ($\text{♩} = \text{ca. } 3 \text{ sec.}$)

Adagio molto ($\text{♩} = 40$); serene, transcendental

Christe!

Fine

[R.I.F. V°]

PI. PIII. (hold down throughout)

(touch node for 5th part harmonic) ** remove L.h.

(PI. PIII. sempre)

(come sopra) ** remove L.h.

(PI. PIII. sempre)

(PI. sempre) (senza PIII.)

Play in the indicated sequence, i.e. A, B, C.

Remove fingers from nodes immediately after chord is struck so that harmonics ring more luminously.

George Crumb: *Songs, Drones, and Refrains of Death* (1962-70)

Begin segment 1 at cue above

1 *tenderly, expressively*
speak El ni-ño e-sta-ba
Elect. Guit. play (♩ = 112) *mp*

2 *very slowly and mournfully* *sing* so lo
Elect. Cb. *pp* (gliss. sempre) *pp* (gliss. sempre) *frem. sempre* (al niente)

3 *whisper* de las al-gas.
Elect. Guit. sul pont. arco *pp* *fz*
Elect. Cb. paca *ppp* (al niente)
 Go to segment 7 and wait for cue

4 *whisper* le de-fien-de del hambre
Elect. Guit. arco *pp* (sempre gliss.) *pp* (sempre gliss.)
Elect. Cb. pizz. o *pp* *pp*
 Go to segment 7 and wait for cue. Tune D string to C#!

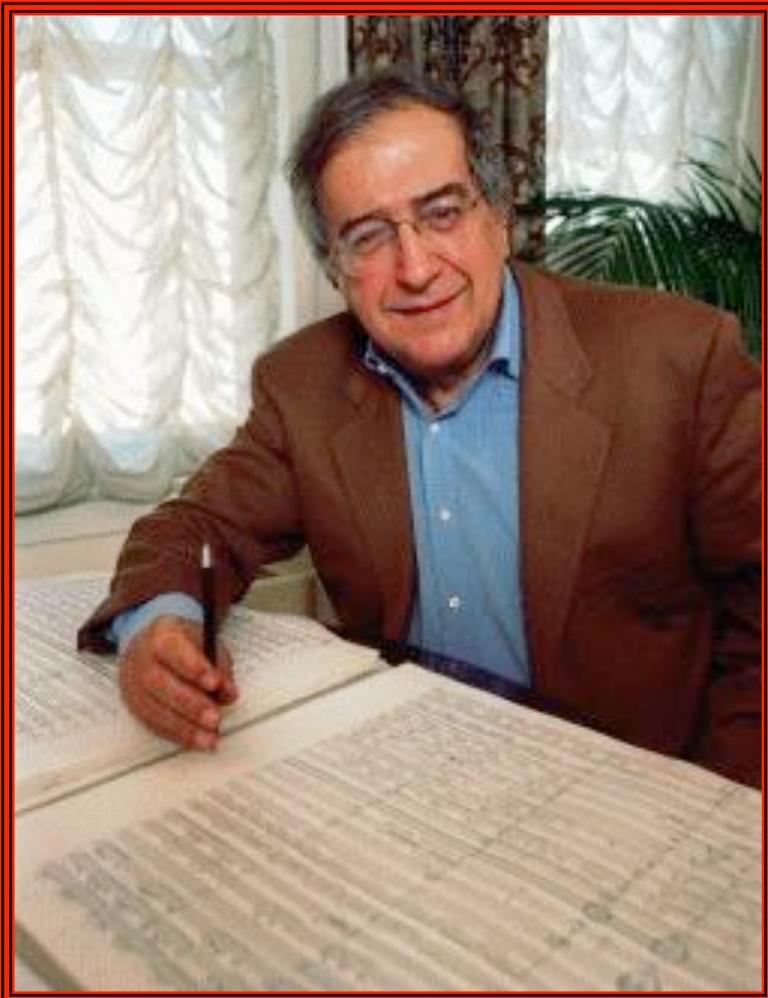
5 *whisper* Un sur-ti-dor
Elect. Guit. with metal rod *mp* (slow) *mp*
Elect. Cb. (pizz.) *mp* *slow*
 que vié-ne de los sue-ños
Elect. Cb. (whisper) *mp*

6 *whisper* con la ciu-dad dor-mi-da
Elect. Guit. with metal rod *pp* *ppp* (al niente)
 Go to segment 7 and wait for cue

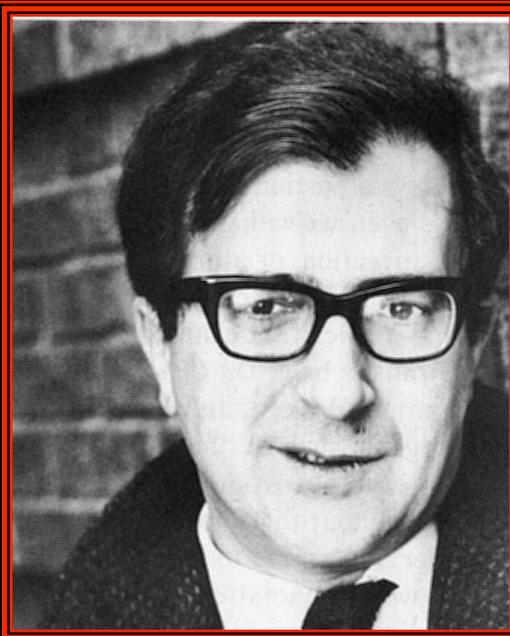
7 *whisper* de las al-gas.
Elect. Guit. sul pont. arco *pp* *fz*
Elect. Cb. arco *pp* *fz*
 Go to segment 7 and wait for cue

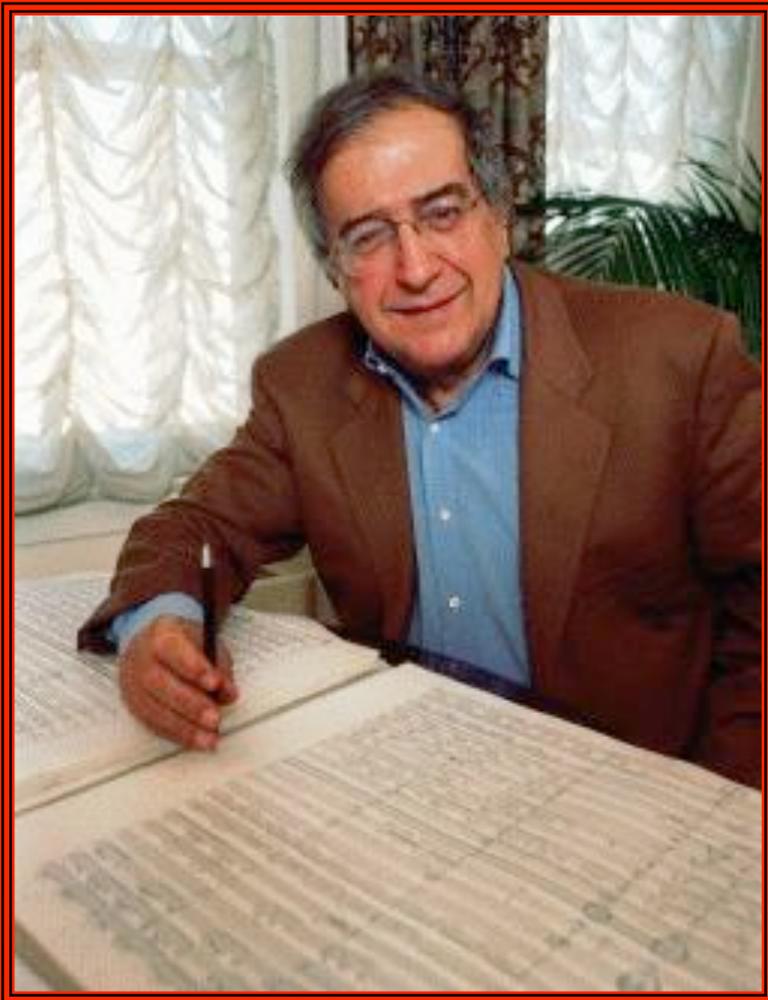
Circle "A" { Electric Guitar Electric Contrabass
 This music must be extremely delicate in order not to cover sympathetic vibrations produced by Baritone voice.

* Stop strings with glass or plastic rod [so-called "bottleneck technique"]



Luciano Berio (1925-2003)



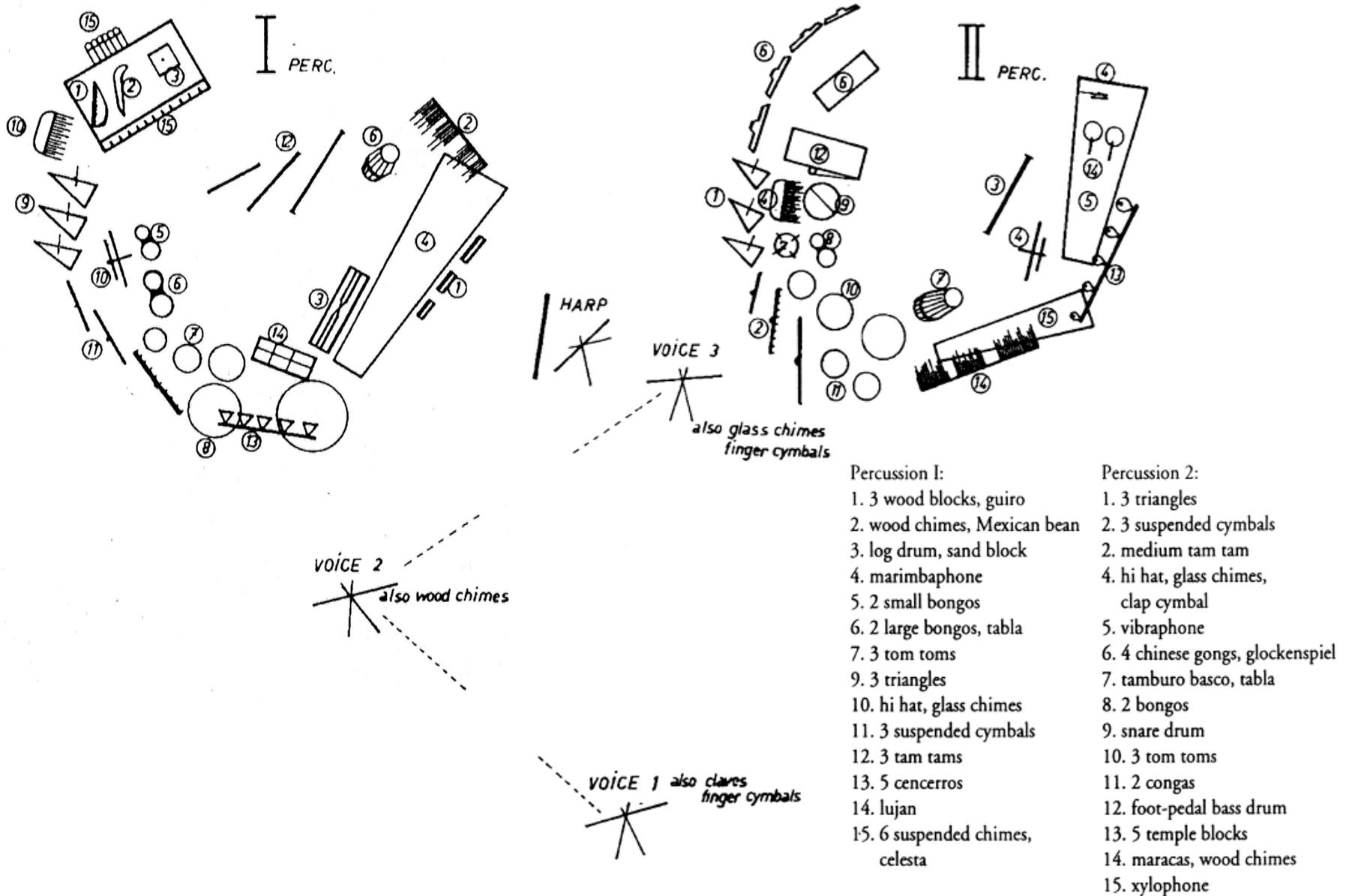


Luciano Berio (1925-2003)

Background

- Born in Oneglia, Italy.
- Contemporary of post WWII avant-garde composers Pierre Boulez, Karlheinz Stockhausen, György Ligeti, and Mauricio Kagel.
- Early interests in serialism and electronic music; co-founded Studio di Fonologia in Milan.
- Vocal works are among his most influential, particularly collaborations with his wife, singer Cathy Berberian.
- *Sequenza*: important series of 14 solo works composed between 1958-2002.
- Quotation, collage, and transcription are important aspects of his output, including reworkings of Mahler, Puccini, Brahms, and Schubert.

Luciano Berio: *Circles* (1960) Instrument Placement



Luciano Berio: *Circles* (1960)

Prefatory Notes

PERC. *

3 wood blocks (1)
mexican bean (2)
log drum (3)

marimbaphone (4)

2 small bongos (5)
2 large bongos (6)
3 tom tom (7)

2 small timpani (8)

3 triangles (9)
hi hat (10)
3 susp. cymbals (11)
3 tam tam (12)
5 cencerros (13)
lu jon (14)

6 susp. chimes / campane (15)

also guiro
also wood chimes
also sand block

also 1 tablas

also glass chimes
the lower with „sizzles“

also celesta / sounds 1 oct. higher/

VOICE

(b.a.)
approx. pitch / optional, exact pitch/

spoken
on the breath

beats the tempo

hand clap
gives attacks

HARP

PERC. *

3 triangles (1)
3 susp. cymbals (2)
1 tam tam (3)
hi hat (4)

vibraphone (5)

4 chinese gongs (6)

tamburo basco (7)

2 bongos (8) snare drum (9)

3 tom tom (10) 2 congas (11)

foot pedal bass drum (12)

5 temple blocks (13)
maracas (14)

xylophone (15)

the medium with „sizzles“

also glass chimes & clap cymbals

also glockenspiel

also 1 tablas

also wood chimes / sounds 1 oct. higher/

* sticks:

1. hard
2. soft
3. wood
4. metal
5. brushes

Luciano Berio: *Circles* (1960)

The image displays a page of a musical score for Luciano Berio's *Circles* (1960). The score is written for voice and piano. The vocal line is the central focus, with lyrics in Italian: "ngi in tal es sij θij g lip o g B sn θk". The piano accompaniment consists of two staves, with the right hand playing a complex, rhythmic pattern of chords and single notes, and the left hand providing a more melodic and harmonic support. The score includes various musical notations such as notes, rests, and dynamic markings. The lyrics are written below the vocal line, and the piano part is written below the vocal line. The score is presented in a standard musical notation format, with a key signature of one flat and a time signature of 4/4.

Luciano Berio: *Circles* (1960)

The image displays a complex musical score for Luciano Berio's *Circles* (1960). The score is written on multiple staves, with various musical notations and performance instructions. Key elements include:

- Staff 1 (Top):** Labeled "Soprano". It features a series of notes with dynamic markings such as *p* and *pp*, and includes a large, bolded section of notes.
- Staff 2:** Contains musical notation with dynamic markings like *p* and *pp*, and a large, bolded section of notes.
- Staff 3:** Includes the instruction "turn" with a circled *ff* marking, followed by a series of notes and a large, bolded section of notes.
- Staff 4:** Features the instruction "walk" and a large, bolded section of notes.
- Staff 5:** Includes the instruction "walk to 2nd stand" and a large, bolded section of notes.
- Staff 6:** Contains musical notation with dynamic markings like *p* and *pp*, and a large, bolded section of notes.
- Staff 7:** Includes musical notation with dynamic markings like *p* and *pp*, and a large, bolded section of notes.
- Staff 8 (Bottom):** Shows musical notation with dynamic markings like *p* and *pp*, and a large, bolded section of notes.

The score is characterized by its intricate notation, including various dynamic markings, performance instructions, and large, bolded sections of notes, reflecting the experimental and avant-garde nature of the piece.

The International Phonetic Alphabet

Front Vowels

[i] ee as in seed
[ɪ] i as in slid
[e] a as in spade
[ɛ] e as in sled
[æ] a as in had
[a] a as in lamb

Central Vowels

[ɜ] ir as in bird (stressed)
[ə] er as in brother
(unstressed)
[ʌ] u as in mud
[ɜ] ir as in British bird
(stressed)
[ə] er as in British brother
(unstressed)

Back Vowels

[ɑ] a as in palm
[ɒ] o as in hot
[ɔ] aw as in paw
[o] o as in float
[u] oo as in look
[u] oo as in boot

The Nasals

[m] m as in mow
[n] n as in no
[ŋ] ng as in sing

The Semi-Vowels

[w] w as in witch
[M] wh as in which
[j] y as in you
[l] l as in law
[r] r as in raw

Diphthongs

[ou] o as in no
[au] ou as in pound
[ei] ai as in pail
[ai] i as in pile
[ɔi] oy as in toy

Non-English Vowels

[y] uh as in German fühler
[ɾ] r as in French sur
[λ] ll as in Castillian calle
[β] b as in Spanish abogado

Continuant Fricatives

[f] f as in five
[v] v as in five
[θ] th as in thy
[θ] th as in bath
[h] h as in hat
[s] s as in sue
[ʃ] ss as in mission
[ʒ] s as in vision
[z] z as in zip

Stop-plosives

[t] t as in to
[p] p as in pat
[b] b as in bat
[d] d as in do
[g] g as in gone
[k] c as in cast

Combinations

[tʃ] ch as in church
[ʃt] shed as in rushed
[dʒ] j as in judge

Non-English Consonants

[ç] ch as in German ich
[X] ch as in German Ach
[R] r as in German rein
[g] g as in German Wagen
[Y] u as in German Mutter
[ø] oe as in Göthe (German)
[œ] o as in German öffnen

Other Signs

[:] lengthen preceding sound
[~] nasalize the sound below
[v] trill the sound below
[?] glottal stop; found in substandard English; substituted for other plosives