

379
N81
No. 6817

CONSTELLATIONS FOR WIND ENSEMBLE AND COMPUTER MUSIC

THESIS

Presented to the Graduate Council of the
University of North Texas in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF MUSIC

By

Rick D. Chatham, B.M.

Denton, Texas

August, 1992

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Chatham, Rick D., *Constellations* for Wind Ensemble and Computer Music, Master of Music (Composition), August, 1992, 53 pages, 2 tables, 6 examples.

Constellations is a single movement work that explores the color between acoustic instruments and computer generated sounds. It is scored for four flutes (two doubling on piccolos), two oboes, two bassoons, eight B \flat clarinets, two B \flat bass clarinets; two alto saxophones, tenor saxophone, baritone saxophone; four trumpets in B \flat ; four horns in F; three trombones, bass trombone; two tubas; piano; six percussionist; and contrabass. The duration of the work is nine minutes and twenty-eight seconds.

Mapping of stellar constellations provide the primary material for all pitch and harmonic progressions throughout the work. Software synthesis and digital sampling techniques coalesce to produce the computer music on tape.

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CHAPTER I.

INTRODUCTION

*Bright star, would I were steadfast as thou art—
Not in lone splendour hung aloft the night
And watching, with eternal lids apart,
Like nature's patient, sleepless Eremite,
The moving waters at their priestlike task
Of pure ablution round earth's human shores.*

- John Keats

Overview

Constellations for Wind Ensemble and Computer Music is a single-movement work with a duration of nine minutes and twenty-eight seconds. The piece is an exploration of color between acoustic instruments and synthetic computer generated sounds. Mappings of stellar constellations provide the primary material for all pitch and harmonic progressions throughout the entire work. Software synthesis and digital sampling techniques coalesce to produce the computer music on tape.

This introduction will provide general information on the work while each of the following chapters discusses the compositional and computer music processes in detail. The appendix contains a listing of each pitch constellation.

Orchestration

Constellations is scored for a standard wind ensemble with a few exceptions. The instrumentation is as follows: four flutes (two doubling on piccolos); two oboes and bassoons; eight B \flat clarinets; two B \flat bass clarinets; two altos, one tenor and one baritone saxophone; four trumpets in B \flat ; four horns in F; three trombones and one bass trombone; two tubas; one piano; six percussionist; and two contrabasses. No acoustic instrument is to be amplified.

The flute, clarinet and saxophone sections are scored to half sing, half hum the words "star," "pulsar," and "galaxy" from sections D to E. This is used to augment the computer music, sampled voice sounds. The singers use no vibrato, and the entire section is unaccented.

Six percussionist are required to perform the work. Extensive scoring of mallet instruments is used throughout the work. Bowed vibraphones and bowed crotales are scored in numerous sections. A large and a small bass drum are called for in section D and sections G through I, used to equipoise the computer music's dominance during those sections. Frequent pitch change, as well as *glissandi*, is scored for the timpani, usually doubling with the contrabasses. The timpani should be positioned next to the contrabasses to facilitate these continual pitch variations.

The Score and Performance

The entire score is marked by time-frames in seconds. There is a natural division every four seconds. Rhythm is interpreted by relative spatial placement of notes. Extension lines and single beams are employed to designate duration of individual notes. There are three different instances of metered time. Time-framed markings are continued through these sections so that synchronization with the tape can be maintained. The computer music is marked with a single extension line.

Primary cues are designated by white arrows. Cues are enumerated in each section from one to five. The conductor is instructed to use one hand to indicate the appropriate number of cue. Other secondary cues are designated which can be signaled by either the conductor or a section leader.

The computer music on tape is prerecorded on Digital Audio Tape (DAT) for high fidelity. Elapsed time from the DAT player should be displayed for the conductor as well as the entire ensemble. This can be accomplished with a video camera with a monitor for the conductor and two or three for the wind ensemble.

Two loud speakers should be placed at each side of the ensemble, stage left and right. To enhance the fusion of the wind ensemble and computer music the speakers should not extend beyond the group of players. Finally, to enhance the blending of acoustic instruments and computer music, no

house lights should be on, and the stage lights should be dimmed as much as possible without using stand lights. This will diminish visual distractions allowing the listeners to focus on sound.

CHAPTER II.

DISCUSSION OF MAPPING AND COMPOSITIONAL TECHNIQUES

Stellar Constellations

In ancient times constellations were confined within the outlines of the forms that they were supposed to represent. Stars that fell adjacent to the forms were called by the Greeks "αμορφωτοι," unformed, and "σποραδες," scattered (Allen 1963). Today, constellations are boundary lines that contain the ancient figures as well as any other stars that have been discovered within its confines.

Ptolemy, in the seventh and eighth books of the *Syntaxis*, lists forty-eight constellations. These 48 constellations, 12 of the zodiac, 21 northern, and 15 southern, were made from 1028 stars, including 102 "αμορφωτοι," unformed. In the early 17th century Johann Bayer added 12 new southern constellations. He also was the first to identify stars within a constellation by Greek and Roman letters. The remaining constellations are generally acknowledged to have been catalogued by Johann Hewel (Hevelius) in the *Prodromus Astronomiae* of 1690 and by Abbé Nicholas Louis de La Caille in his *Mémoires* of 1752 and his *Coelum Stelliferum* of 1763 (Allen 1963). Today, eighty to

ninety constellations (eighty-six used for the mapping of *Constellations*) are generally acknowledged with millions of stars found within these boundaries.

Mapping to Pitch Constellations

In *Constellations* one stellar constellation is directly mapped to one pitch constellation or pitch set. The piece then proceeds from one pitch constellation to the next, with most constellations acting as a antecedent to the following constellation. Some constellations are juxtaposed, while others act as break points. With some constellations containing thousands of distinct stars, it became necessary to filter the dimmest stars from each constellation. To achieve this only stars of five or greater magnitude were employed. Astronomers have long used star magnitudes to judge starlight brightness in relation to one another. Stars of the first magnitude are the brightest stars, while stars of the sixth magnitude are said to be 1/100 as bright as first magnitude stars. By eliminating sixth magnitude and dimmer stars, a balanced number of stars was achieved; thus a desirable number of pitches for each pitch constellation was devised. The constellations ranged from 49 stars in Centauras to no stars in Mensa, which was the only constellation which had no stars of the fifth magnitude or greater. With the subtraction of Mensa, this left the composer with 86 pitch constellations.

Next, each star was mapped to pitch from its estimated distance from earth (measured in parsecs or 3.2633 in light years). Within the wind ensemble's limited seven octave range the composer deemed DD to be the lowest pitch and c⁵ to be the highest in the pitch map. The nearest star (excluding the sun) is α Proxima Centauri at 1.32 parsecs,

TABLE I. Pitch to Star Conversion

Pitch	Distance (parsec)	C	3.42	c	10.75	c ¹	33.73
		C#	3.77	c#	11.82	c#	37.11
DD	1.32	D	4.14	d	13.01	d	40.82
EE \flat	1.45	E \flat	4.56	e \flat	14.31	e \flat	44.90
EE	1.60	E	5.01	e	15.74	e	49.39
FF	1.76	F	5.52	f	17.31	f	54.33
FF#	1.93	F#	6.07	f#	19.04	f#	59.76
GG	2.13	G	6.67	g	20.95	g	65.74
GG#	2.34	G#	7.34	g#	23.04	g#	72.31
AA	2.57	A	8.08	a	25.34	a	79.54
BB \flat	2.83	B \flat	8.88	b \flat	27.88	b \flat	87.50
BB	3.11	B	9.77	b	30.67	b	96.25
c ²	105.87	c ³	332.27	c ⁴	1042.79	c ⁵	3272.73
c#	116.96	c#	365.49	c#	1147.07	c#	3600.00
d	128.10	d	402.04	d	1261.78		
e \flat	140.91	e \flat	442.25	e \flat	1387.96		
e	155.00	e	486.47	e	1526.75		
f	170.50	f	535.12	f	1679.43		
f#	187.56	f#	588.63	f#	1847.37		
g	206.31	g	647.49	g	2032.11		
g#	226.94	g#	712.24	g#	2235.32		
a	249.64	a	783.47	a	2458.85		
b \flat	274.60	b \flat	861.81	b \flat	2704.73		
b	302.06	b	947.99	b	2975.21		

mapped to DD and the furthest star (fifth magnitude or greater) is σ star in Carina at ~3600 parsecs. An exponential scale ($n^{1.1}$) was then used to evenly distribute the pitches between 1.32 and 3600 parsecs. The entire pitch to star scale can be viewed in TABLE I. The selected stars from each constellation were then converted to pitch according to the described scale. An example of a complete constellation is shown in TABLE II. In the constellation Corona Borealis stars ζ and ι result in the same pitch, therefore there will be fewer pitches than there are stars in many constellations. The resulting pitch

TABLE II. Corona Borealis Specifications and Pitch Map

Star	Virtual Magnitude	Distance (parsec)	Pitch
α	5793	2.23v	g#
β	5747	3.68	f
δ	5889	4.63	c# ¹
ϵ	5947	4.15	g# ¹
ζ^1	5833	5.0 + 6.0	d ²
ζ^2	5834	4.7	d ²
η	5727/8	4.98	e ^b
θ	5778	4.14	c ²
ι	5971	4.99	d ²
κ	5901	4.82	c ¹
λ	5936	3.84v	g ¹
ξ	6103	4.85	b ^{b1}
σ	6063/4	5.22	g
τ	6018	4.76	f ¹

constellation is shown in Figure 1. Appendix A has a complete listing of each constellation and its pitch set.



Figure 1: Corona Borealis Constellation

Constellation Ordering

In star atlases, the scientific delimitation of the constellations is divided into two hemispheres, the northern and the southern. This division of the two hemispheres is achieved by the equinox or either of the two points on the celestial sphere where the celestial equator intersects the ecliptic.

Constellations is likewise divided into two sections, although there is no musical interruption. The work begins in the center or pole of the southern hemisphere in the constellation Octans. The progression then moves to Volans and proceeds counterclockwise until it reaches the constellation Cetus. This corresponds in *Constellations* to the beginning through the end of section H. Section I begins the section of the work with constellation Ursa Minor in the center of the northern hemisphere. This time the

progression moves to Draco and then proceeds clockwise until it reaches the last constellation Leo.

Intuitive Decisions

Aside from the above mappings, all other compositional decisions were made intuitively. Much of the rhythm and the event pacing was a direct result of the computer-generated sounds. Special attention was paid to voice leading and common tones between adjacent pitch constellations in order to create musical coherence. Exact transpositions of vertical sonorities were used at various points in the work when pitch constellations were similar.

The entire piece is episodic in nature. There is an overall arch form to the work with the peak being at the end of section H. The computer music timbres at the beginning of the work also end the work.

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CHAPTER III.

DISCUSSION OF COMPUTER MUSIC

Software Synthesis Techniques

In order to achieve cohesion between acoustic instruments and the computer generated sounds, software synthesis techniques were highly utilized. FM (frequency modulation) techniques and additive synthesis provided the composer a comprehensive array of sounds to assimilate and augment the wind ensemble's timbres. Because of the unlimited number of oscillators and generators available in software synthesis, many complex and desirable timbres were obtainable. The programs used by the composer—computer high-level language dependent—furnished the precision needed to coordinate events between the performers and the computer generated sounds. A high speed computer workstation also provided the composer immediate feedback and experimentation, a creative environment only recently made available to computer music composers.

The frequency modulation instrument that begins and ends the work is based on a series of six carrier oscillators with companion modulating oscillators. Figure 2 diagrams the FM instrument with its large number of

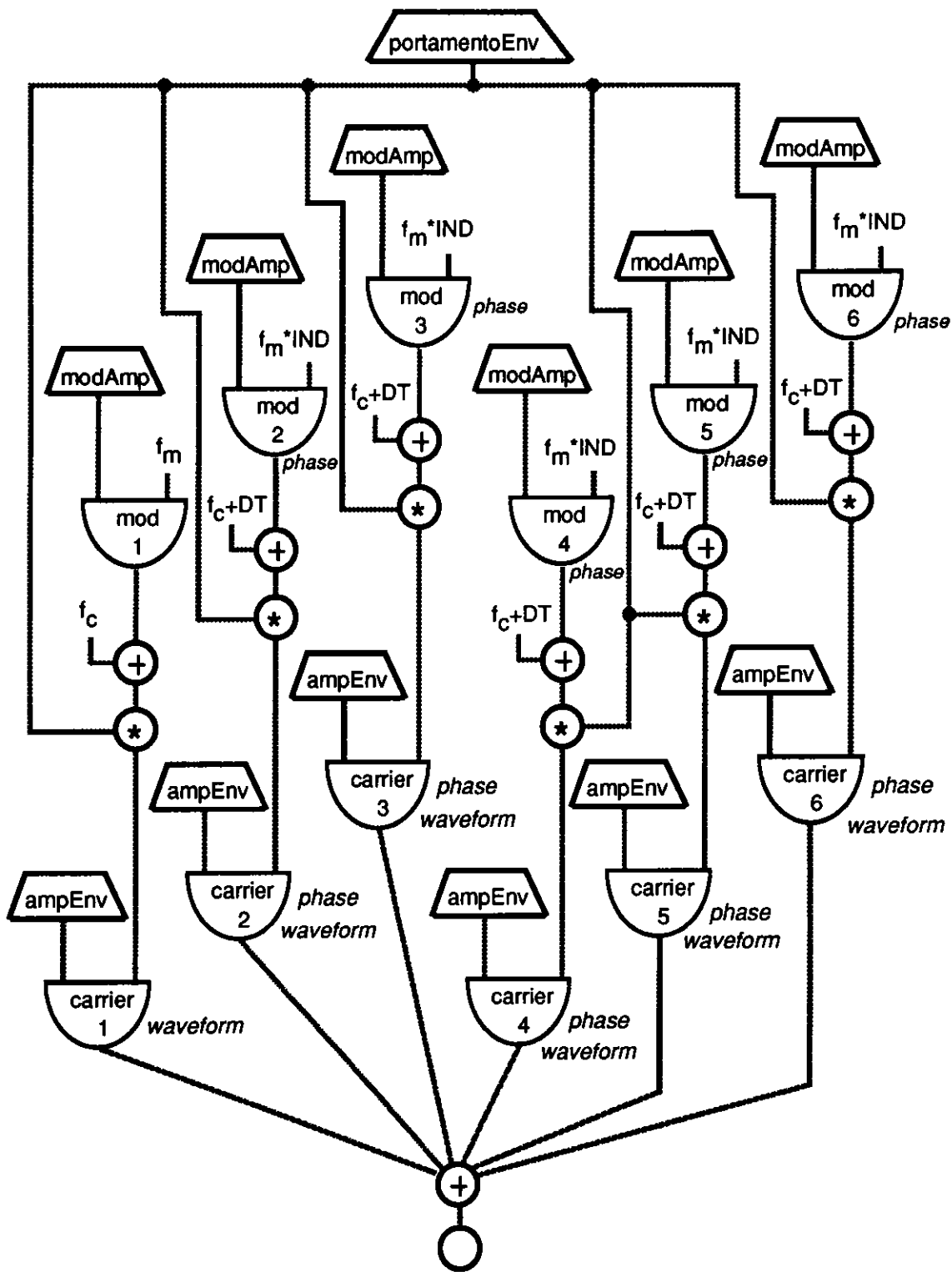


Figure 2: FM Portamento Instrument

amplitude envelopes. Straight-line and exponential envelopes were applied, so that each carrier oscillator becomes prevalent at different times through the duration of each note. These envelopes also aid in the mapping of acoustic instruments' attacks and decays. Frequency is obtained from the fundamental frequency (f_c), the deviation acquired from the modulating oscillator. The frequency is also slightly altered by adding a detuning factor (DT) to carrier oscillators two through six. Each carrier

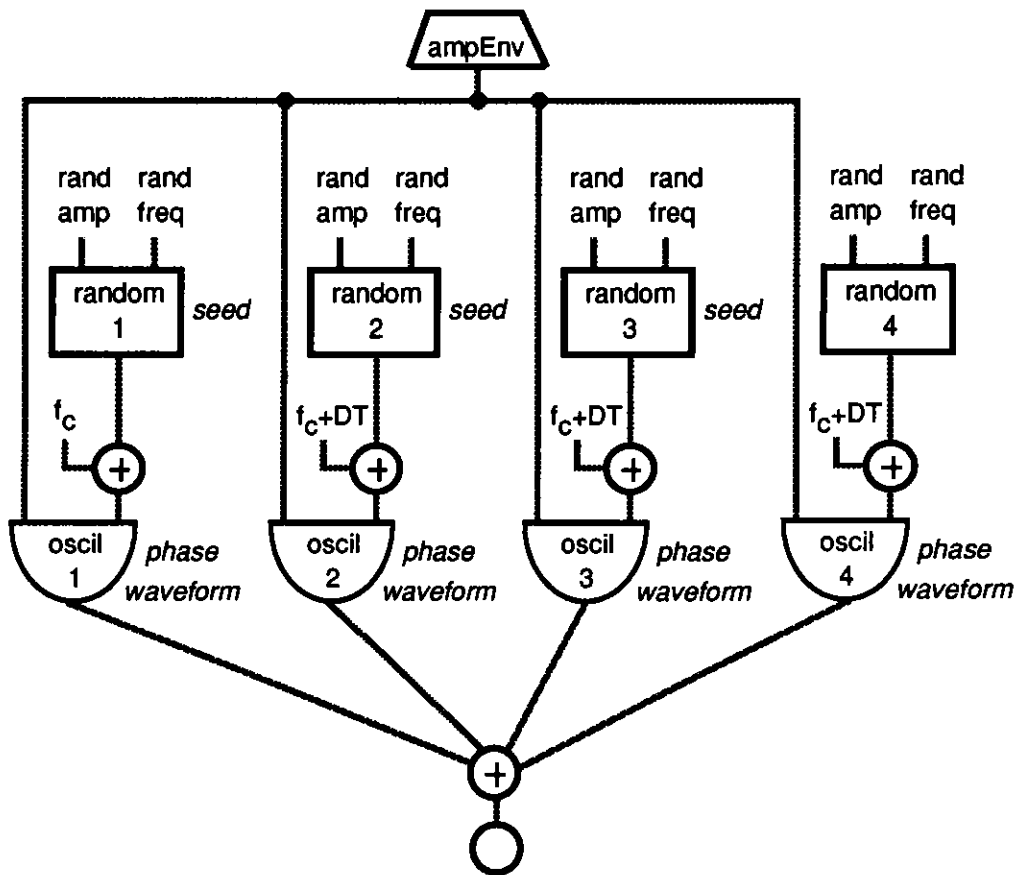


Figure 3: FM Static Instrument

oscillator also employs a different waveform and starts at a different point in the wavetable (phase), thus producing a sound with little periodicity. The last unit generator of the instrument is a portamento envelope that is multiplied to the carrier frequency. The extensive number of parameters applied to this envelope allowed for precise portamento for each note with exact frequency control and delay before the portamento was to proceed.

Figure 3 is a diagram of an additive synthesis instrument used primarily to generate low frequency sounds. A quartet of random generators produced a spectrum of white noise. The particular random generator used reduced the amount of high-frequency energy in the noise. Lower inputs of random frequency produced a more stable and desired result.

All notes generated throughout the work were produced by three identical instruments. The first instrument produced the desired frequency, while the frequencies of the second and third instruments were placed slightly above and below the desired frequency. This was done to accomplish a "chorus" effect.

Digital Sampling and Sound Transformation

Other computer music was generated by the use of sampling techniques. Minutes of spoken voice, both male and

female, were sampled at a high sampling rate through an analog to digital convertor directly to the computer. Using a graphic sound editor, small phrases and single words were extracted. These words included "star," "sun," "crab nebula," "brown dwarf," and "pulsar." Several techniques were employed to transform the sounds including transposing and filtering.

A time dilation method was used to manipulate many of the vocal sounds. Common transposing methods simply add or subtract samples from the sound. To transpose a sound down an octave the number of samples are doubled. The duration of the resulting sound is also doubled. The program used throughout the work is independent of duration. The sound is segmented into frames, which are then transposed. A bevel curve is designated to interpolate between frames.

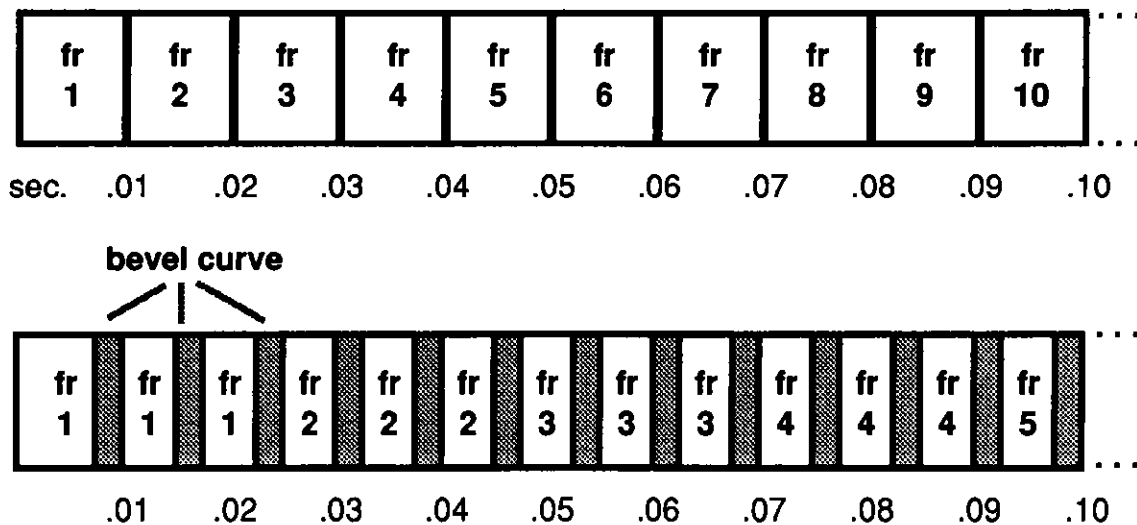


Figure 4: Time Dilation Method

This process is illustrated in Figure 4. Here, the sound is being stretched by a factor of two. The resulting transposition could be either up or down in pitch. The program automatically selects the number of frames needed to produce the desired transposition and duration. By distorting the frame size and bevel time, a wide range of effects far removed from the original source can be obtained. By using a looping algorithm, stacking of the sounds with different transpositions can greatly enhance the subtle vocal artifacts.

Auditory Localization

All computer-generated sounds and sampled sounds were generated with no reverberation and were monaural. A room simulation program was used to produce stereo separation and reverberation. Through the use of a multiple delay line filter with low-pass filtering and attenuation, the program produces an acoustic space for the listener. Sounds are then passed through a stereo reverberation unit consisting of randomly-varying comb and all-pass filters (Scott 1989). The program allows for the moving of the sound anywhere in designated space. A reflection rate can be specified to the program to simulate absorption factor of the walls. A reverberation time is also specified to control the number of reflection of sounds. In the program, the room is

specified by width, length and height, thus creating a three-dimensional space. Finally, the listener is placed in the room from which the auditory cues are directed.

Figure 7 illustrates the room simulation for the sound, "neutron star." Here the perceived sound is slowly moved around the listeners background. Reverberation time is long, and reflection rate is a medium value, all these parameters producing a "wet" sound.

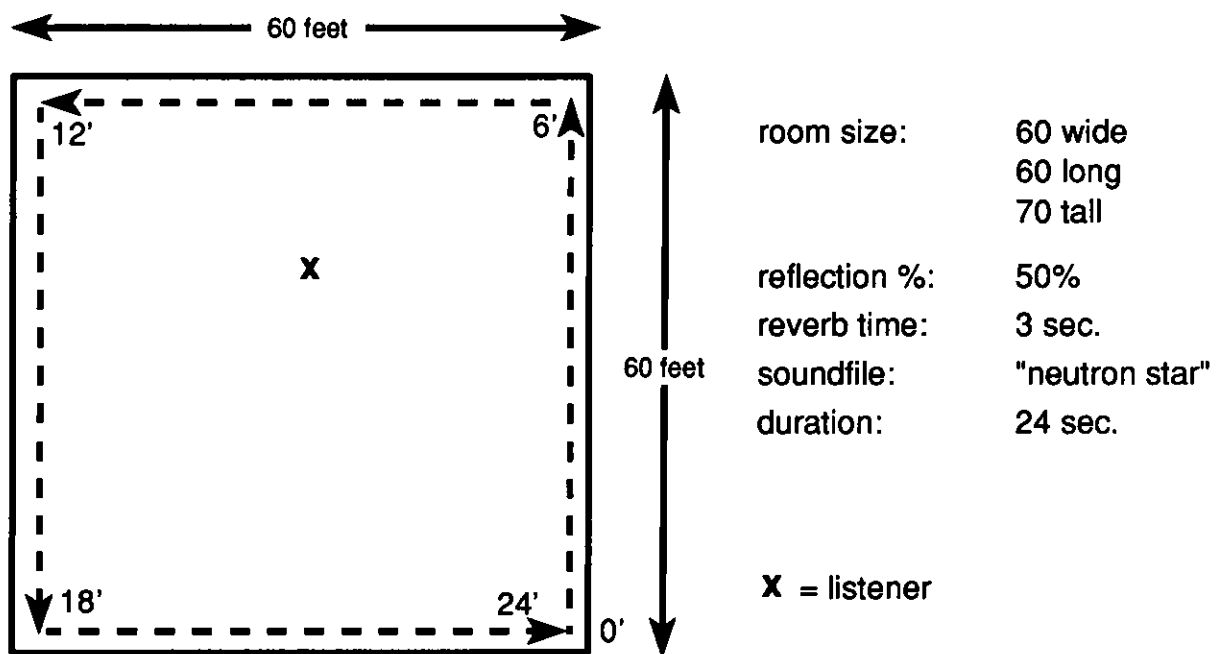
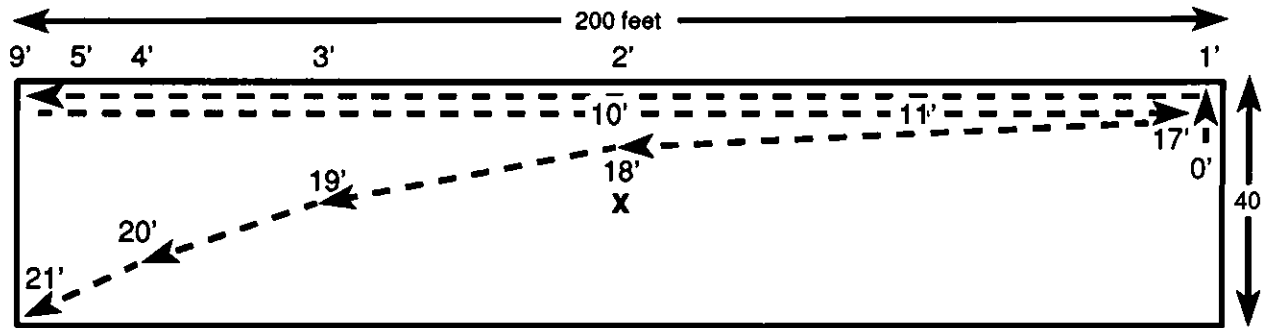


Figure 7: Room Simulation for Sound, "neutron star"

The "Doppler effect" can be achieved by quickly moving perceived sounds near the listener. The Doppler shift is the perceived change in frequency observed when a sound source and



room size:	200 wide	reverb time:	2 sec.	X = listener
	40 long	soundfile:	const.52-56	
	70 tall	duration:	21 sec.	
reflection %:	70%			

Figure 8: Room Simulation with Doppler Effect

the listener are moving relative to each other. Figure 8 shows an elongated room which aids in the rapid movement of the sounds. In the simulated room the perceived sound moves 200 feet exponentially in front of the listener in less than four seconds.

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- Moore, F. Richard. "A General Model for Spatial Processing of Sounds." Computer Music Journal, 7, no. 2 (1983): 6-15.
- Scott, Douglas. "A Processor for Locating Stationary and Moving Sound Sources in a Simulated Acoustic Environment." 1989 International Computer Music Conference Proceedings, San Francisco: Computer Music Association, 277-280.
- Vercoe, Barry. CSOUND: A Manual for the Audio Processing System and Supporting Programs. M.I.T., 1986.

APPENDIX A

Listing of Each Pitch Constellation

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

8va - - - - - thru bar 86

Musical score for measures 1-8. The score is written on three staves: Treble, Middle, and Bass. Measure 1 has a treble clef and a sharp sign. Measure 2 has a treble clef and a sharp sign. Measure 3 has a treble clef and a sharp sign. Measure 4 has a treble clef and a sharp sign. Measure 5 has a treble clef and a sharp sign. Measure 6 has a treble clef and a sharp sign. Measure 7 has a treble clef and a sharp sign. Measure 8 has a treble clef and a sharp sign.

Octans	Volans	Chamaeleon	Musca Australis	Apus	Pavo	Indus	Tucana
--------	--------	------------	-----------------	------	------	-------	--------

⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

Musical score for measures 9-16. The score is written on three staves: Treble, Middle, and Bass. Measure 9 has a treble clef and a sharp sign. Measure 10 has a treble clef and a sharp sign. Measure 11 has a treble clef and a sharp sign. Measure 12 has a treble clef and a sharp sign. Measure 13 has a treble clef and a sharp sign. Measure 14 has a treble clef and a sharp sign. Measure 15 has a treble clef and a sharp sign. Measure 16 has a treble clef and a sharp sign.

Hydrus	Horologium	Reticulum	Dorado	Pictor	Carina	Centaurus	Crux
--------	------------	-----------	--------	--------	--------	-----------	------

17

18

19

20

21

22

23

24

Circinus Triangulum Australe Norma Ara Corona Australis Telescopium Microscopium Girus

25

26

27

28

29

30

31

Phoenix Fornax Eridanus Cælum Columbia Lepus Monoceros

32 33 34 35 36 37 38 39

Canis Major Puppis Vela Pyxis Antlia Hydra Crater Corvus

40 41 42 43 44 45 46 47

Virgo Libra Lupus Scorpius Ophiuchus Scutum Sagittarius Capricornus

xix

(48)	(49)	(50)	(51)	(52)	(53)	(54)	(55)
Piscis Australis	Aquarius	Sculptor	Cetus	Ursa Minor	Draco	Cepheus	Cassiopeia

(56)	(57)	(58)	(59)	(60)	(61)	(62)	(63)
Camelopardus	Ursa Major	Canes Venatici	Coma Berenices	Boötes	Corona Borealis	Serpens	Hercules

64

65

66

67

68

69

70

71

Musical notation for constellations 64-71. The notation is arranged in a grid with three staves (treble, middle, and bass clefs) and eight columns. Each column contains musical notes and accidentals for the three staves. The notes are often grouped into chords or clusters. The accidentals include sharps, flats, and naturals.

Lyra	Cygnus	Vulpecula	Sagitta	Aquila	Delphinus	Equuleus	Pegasus
------	--------	-----------	---------	--------	-----------	----------	---------

72

73

74

75

76

77

78

Musical notation for constellations 72-78. The notation is arranged in a grid with three staves (treble, middle, and bass clefs) and seven columns. Each column contains musical notes and accidentals for the three staves. The notes are often grouped into chords or clusters. The accidentals include sharps, flats, and naturals.

Lacerta	Andromeda	Pisces	Triangulum	Aries	Perseus	Auriga
---------	-----------	--------	------------	-------	---------	--------

79 80 81 82 83 84 85 86

Taurus Orion Gemini Canis Minor Cancer Lynx Leo Minor Leo

constellations
for wind ensemble and computer music

Rick Chatham

1992

Master's Thesis completed at the University of North Texas

Instrumentation

2	flutes 1 & 2 (double as piccolo)	}	singers 1
2	flutes 3 & 4		
2	oboes 1 & 2		
2	bassoons 1 & 2	}	singers 2
4	Bb clarinets 1 & 2		
4	Bb clarinets 3 & 4		
2	Bb bass clarinets	}	singers 3
2	alto saxophones 1 & 2 tenor & baritone saxophone		

2 trumpets in Bb 1 & 2
2 trumpets in Bb 3 & 4
2 horns in F 1 & 2
2 horns in F 3 & 4
2 trombones 1 & 2
2 trombones 3 & 4 (4th bass trombone)
2 tubas

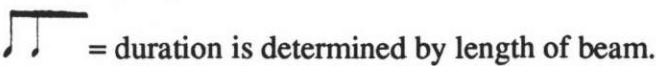



computer music on tape

piano

percussion 1. vibraphone
percussion 2. vibraphone, marimba, glockenspiel
percussion 3. xylophone, glockenspiel, marimba, tam tam, 2 susp. cymbals, tom-toms
percussion 4. xylophone, small triangle, bass drum, bell tree
percussion 5. crotales, bass drum, small bass drum, marimba
percussion 6. timpani

contrabass

Instructions

1. Score is not transposed, except instruments which transpose at the octave (or double octave), notated at their written pitch.
2. Singing/Humming: Instrumentalists should sing the pitches indicated in the exact register. Men may use *false* *setto*, if necessary. No vibrato.
3. Accidentals apply only to the notes they precede, except when tied or immediately repeated.
4. X = no meter. Music is time-framed in seconds. Rhythm is interpreted by the relative spatial placement of notes.
5.  = duration is determined by length of beam.
6.  = 
7. Lapsed time should be viewed by conductor and ensemble. Three video monitors should face ensemble to show lapsed time. Video camera should be used to display DAT's lapsed time.
8.  Cues are numbered within a section from one to five. Conductor should use one hand to indicate number of cue.
9. Performance: Loud speakers should be placed at each end of ensemble. They should not extend beyond the players.
10. Lights: House lights should be entirely dimmed. Stage lights should be dimmed as much as possible without using stand lights.

constellations

for wind ensemble and computer music

duration is 9.5 minutes

Rick Chatham (1992)

This musical score is for the piece "constellations" by Rick Chatham, composed in 1992. It is a score for a wind ensemble and computer music, with a total duration of 9.5 minutes. The score is written for a 24-measure segment, with time markers at 0", 4", 8", 12", 16", 20", and 24".

The score includes parts for the following instruments:

- Flute 3:** Part 3, marked *pp*.
- Bassoon 2:** Part 2, marked *pp*.
- Clarinet 3/4:** Parts 3 and 4, marked *pp*.
- Bass Clarinet (b.clr.):** Part 1, marked *pp* at 8" and *mp* at 16".
- Saxophone (Sax):** Parts 1 and 2, marked *f*.
- Trumpet (trpt.):** Parts 1, 2, 3, and 4, marked *f* at 0" and *pp* at 8" and 16".
- Horn (hrn.):** Parts 1, 2, 3, and 4, marked *f* at 0" and *pp* at 8" and 16".
- Timpani (trmb.):** Parts 3 and 4, marked *pp* at 8" and *mp* at 16".
- French Horn (fba.):** Part 1, marked *mp* at 16".
- Computer Music (cmpt.):** Part 1, marked *mp* at 16".
- Piano (pno.):** Part 1, marked *f* at 0" and *mp* at 16".
- Vibraphone 1 (vibes 1.):** Part 1, marked *mp* at 8" and *f* at 16".
- Vibraphone 2 (vibes 2.):** Part 2, marked *mp* at 8" and *f* at 16".
- Xylophone 3 (xylo 3.):** Part 3, marked *mp* at 16".
- Xylophone 4 (xylo 4.):** Part 4, marked *mp* at 16".
- Crotales:** Part 1, marked *mp* at 8" and *mf* at 16".
- Bass Drum 5 (b.drums):** Part 5, marked *ff* at 0".
- Tom-tom 6 (timp. 6.):** Part 6, marked *ff* at 0".
- Contra Bass (cb.):** Part 1, marked *mp* at 0" and *mf* at 16".

Key performance instructions include "Expressive" markings (marked with an 'X') for the Saxophone, Trumpet, Computer Music, Piano, Vibraphone, and Contra Bass parts. Dynamic markings range from *pp* (pianissimo) to *ff* (fortissimo). The score also includes various articulation and performance techniques such as "bowed" for vibraphone and xylophone, "i.v." (in vivo) for vibraphone and xylophone, and "gliss." (glissando) for the Tom-tom 6.

B

Handwritten musical score for a symphony orchestra. The score is organized into systems with time markers at the top: 48", 52", 56", 1:00, 1:04, 1:08, and 1:12. The instruments and their parts are as follows:

- Flute (Fl.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Oboe (ob.):** 3 and 4 parts, starting at 48" with a dynamic of *f*.
- Bassoon (bsn.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Clarinet (clr.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Bass Clarinet (b. clr.):** 3 and 4 parts, starting at 48" with a dynamic of *f*.
- Saxophone (SAX):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Trumpet (trpt.):** 1, 2, 3, and 4 parts, starting at 48" with a dynamic of *f*.
- Horn (hrn.):** 1, 2, 3, and 4 parts, starting at 48" with a dynamic of *f*.
- Trumpet (trmb.):** 1, 2, 3, and 4 parts, starting at 48" with a dynamic of *f*.
- Tuba (tba.):** 1, 2, 3, and 4 parts, starting at 48" with a dynamic of *f*.
- Compt. (Cmpt.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Piano (pno.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Bowed Vibes (bowed vibes):** 1 and 2 parts, starting at 48" with a dynamic of *mf*.
- Glockenspiel (glock.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Xylophone (xylo.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Timpani (timp.):** 1 and 2 parts, starting at 48" with a dynamic of *f*.
- Contra Bass (cb):** 1 and 2 parts, starting at 48" with a dynamic of *f*.

Additional markings include *pp* (pianissimo) for many instruments, *mf* (mezzo-forte) for others, and *l.v.* (largo vivace) for the bowed vibes. A boxed 'B' is present at the bottom left and top left of the page.

C

1:12 1:16 1:20 1:24 1:28 1:32 1:36

picc. 1 2

fl. 3

ob.

bsn.

clr. 1 2 3 4

b. clr.

sax 1 2

1:12 1:16 1:20 1:24 1:28 1:32 1:36

hrrn. 1 2 3 4

trmb. 1 2 3 4

tba.

1:12 1:16 1:20 1:24 1:28 1:32 1:36

cmpl.

pno.

bowed vibes

3. glock

4. small triangle

bowed crot.

timp

1:12 1:16 1:20 1:24 1:28 1:32 1:36

cb

C

D

2:00 2:04 2:08 2:12 2:16 2:20 2:24

X Distant

f.l. 1 2 3 4

ob

bsn

clr. 1 2 3 4

b.clr.

sax 1 2 3 4

singers 2. half sing/half hum NO vibrato
sta(h)

singers 3. NO vibrato
ga(h)

X Distant

trpt. 1 2 3 4

hrn. 1 2 3 4

tmb. 1 2 3 4

tba.

X Distant

empt.

pno. l.v.

X Distant l.v.

vibes l.v.

mar. f mp

xylo.

b.dr.

timp. gliss.

cb. gliss.

X Distant

D

2:24 2:28 2:32 2:36 2:40 2:44 2:48

singers 1. *p* no vibrato *cresc.* *mf*
pal sa(h)

bsn. 1. *p* *mf* *f* *mp* *mf*

singers 2. *ab*

b. cl. *p* *cresc.* *mf* *f* *mp* *mf*

singers 3. *b* (ah) la(h)

tba. *mp* *mf* *f* *mp* *mf*

2:24 2:28 2:32 2:36 2:40 2:44 2:48

cmpt.

2:24 2:28 2:32 2:36 2:40 2:44 2:48

vibes *f* *mp* *f* *mp*

mar. *f* *mp* *f* *mp*

tan tam *f* *f* *f*

small b. dr. wooden sticks move to center back towards the rim

timp. *f* gliss. *mf* gliss. *f*

2:24 2:28 2:32 2:36 2:40 2:44 2:48

cb gliss. gliss.

2:48 2:52 2:56 3:00 3:04 3:08 3:12

2

singers 1. (ah) pul - sa(h)r

bsn. 2

singers 2. each singer sing/hum independently sf(ah)-r cresc

b.clr.

singers 3. each singer sing/hum independently (ah) ga - la - xy(e) cresc

tba.

trpt. 1 2 3 4

hrn. 1 2 3 4

trmb. 1 2 3 4

emph.

pho. mf mf

vibes. f mf

mar. mf f

tam. l.v. f

xylo. wooden sticks move to center - -

timp. gliss. mf f

eb. gliss. f

mf f

3:36 3:40 3:44 3:48 3:52 3:56 4:00

2 3 4

fl. 3 4
ob.
bsn.
clr. 1 2 3 4
b.clr.
SAX 1 2 T B

Legato
mp
sim.
Legato
mp
sim.
Legato
mp
sim.
mp
sim.
mp
sim.
mp
sim.

picc. 1 2
Legato
mp
sim.

3:36 3:40 3:44 3:48 3:52 3:56 4:00

3:36 3:40 3:44 3:48 3:52 3:56 4:00

div.
tba. 1 2

cmpt.

3:36 3:40 3:44 3:48 3:52 3:56 4:00

4:00 4:04 4:08 4:12 4:16 4:20 4:24

picc. 2

fl. 3 4

ob.

bsn.

clr. 1 2 3 4

b. clr.

sax. 1 2 T 6

cresc.

mf

X

4:00 4:04 4:08 4:12 4:16 4:20 4:24

tba.

cresc.

mf

mp

tr. mb. 3 4

X

Freely - add accents ad lib.

pno.

mp

mf

4:16 4:20 4:24

one rapid bow + l.v.

1. bowed vibes mf one rapid bow

2. mf

sm. susp. cymb. 3. mp

X

F

4:48 4:52 4:56 5:00 5:04 5:08 5:12

G

Aggressive

Fl. 3
fade out

clr. 2
fade out
Freely solo
mf
pp

4:48 4:52 4:56 5:00 5:04 5:08 5:12

Aggressive

trpt. 1 2
3 4
p

hrn. 1 2
3 4
p

tmb. 1 2
3 4
p

tba. p

4:48 4:52 4:56 5:00 5:04 5:08 5:12

Aggressive

comp. p

pno. p
stop with computer music

4:48 4:52 4:56 5:00 5:04 5:08 5:12

Aggressive

tom 3. p
wooden sticks move to center

b. dr. 4. p
wooden sticks move to center

timp. 6. p

sm. b. dr. 5. p
wooden sticks move to center
stop with computer music

4:48 4:52 4:56 5:00 5:04 5:08 5:12

Aggressive

cb p

G

5:12 5:16 5:20 5:24 5:28 5:32 5:36

picc. 1 *sol.* *mf*

fl. $\frac{2}{4}$ *f*

ob. *f*

bsn. *f*

clv. $\frac{2}{2}$ *f*

$\frac{3}{4}$ *f*

b. clv. *f*

SAX *f*

T *f*

B *f*

5:12 5:16 5:20 5:24 5:28 5:32 5:36

1 *f*

2 *f*

3 *f*

4 *f*

1 *f*

2 *f*

3 *f*

4 *f*

1 *f*

2 *f*

3 *f*

4 *f*

1 *f*

2 *f*

3 *f*

4 *f*

5:12 5:16 5:20 5:24 5:28 5:32 5:36

Cmp. *f*

pno. *f*

5:12 5:16 5:20 5:24 5:28 5:32 5:36

gluck. *f*

f.t. 3. *f*

b.dr. 4. *f*

b.dr. 5. *f*

timp. *f*

5:12 5:16 5:20 5:24 5:28 5:32 5:36

cb. *f*

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6:10

6:04

6:08

6:12

6:16

6:20

6:24

3

4

5

fl. 3/4

clr. 1/2

picc. 1
fl. 2

ob.

bsn.

clr. 3/4

b. clr.

1
2
SAX

1
2

6:00

6:04

6:08

6:12

6:16

6:20

6:24

trpt.

trn.

trmb. 2

trmb. 3

tuba

comp.

pno.

vibes

xylo.

glock 3.

t. imp

cb.

J

1

2

3

6:24

6:28

6:32

6:36

6:40

6:44

6:48

X Harmonious

b. cl. *Solo* *Freely* *mf* *f* *mf* *Solo* *Freely*

a. sax 1. *mf* *f*

X Harmonious

6:24

6:28

6:32

6:36

6:40

6:44

6:48

trmb. 1 2 *no accents - blend with computer music* *gliss.* *mp* *mf*

trmb. 3 4 *no accents - blend with computer music* *gliss.* *mp* *mf*

tba *no accents - blend with computer music* *mp* *mf*

X Harmonious

6:24

6:28

6:32

6:36

6:40

6:44

6:48

cmpt.

cb *gliss.* *gliss.* *mp* *mf* *mp* *mf* *f* *mp* *f*

J

4

5

K

6:48

6:52

6:56

7:00

7:04

7:08

7:12

b. cl.

a. sax 1

hrr. 1

trmb. 1

trmb. 2

trmb. 3

trmb. 4

trba.

cmpt.

pno.

vibes 1

vibes 2

bell tree

timp.

cb

6:48 6:52 6:56 7:00 7:04 7:08 7:12

6:48 6:52 6:56 7:00 7:04 7:08 7:12

6:48 6:52 6:56 7:00 7:04 7:08 7:12

6:48 6:52 6:56 7:00 7:04 7:08 7:12

mp f mp f mp f mp f p

K

7:12 7:16 7:20 7:24 7:28 7:32 7:36

2
1

2

bsn. 1

Freely solo

mf f

b. cl.

a. sax 1

mp f mp f p f mp

7:12 7:16 7:20 7:24 7:28 7:32 7:36

h. 1

2

f p f mp

trump. 1

2

3

4

f f mp

tuba

f mp

7:12 7:16 7:20 7:24 7:28 7:32 7:36

comp.

pno.

f p DP

7:12 7:16 7:20 7:24 7:28 7:32 7:36

vibes 1

2

f pp f pp

bell tree

mf

timp.

p f p f

7:12 7:16 7:20 7:24 7:28 7:32 7:36

cb

p f mp

7:36 7:40 7:44 7:48 7:52 7:56 8:00

3 4

bsn. 1

clr. 1 Solo Freely mf f

b. clr.

q. sax. 1 2 mf mp mf mp

7:36 7:40 7:44 7:48 7:52 7:56 8:00

trpt. 1 Solo Freely mf f

hrn. 1 2 mf mp mf mp

trmb. 1 2 3 4 mf mp mf mp

tba. mf mp

7:36 7:40 7:44 7:48 7:52 7:56 8:00

cmpt.

7:36 7:40 7:44 7:48 7:52 7:56 8:00

cb. f mf f mf

Handwritten musical score for a band. The score is organized into systems, each with a time marker at the top and bottom. The instruments listed on the left include:

- brn.** (Brass) - 1, 2
- clr.** (Clarinet) - 1, 2, 3, 4
- Sax** (Saxophone) - 1, 2, 3, 4
- trpt.** (Trumpet) - 1, 2, 3, 4
- hrn.** (Horn) - 1, 2, 3, 4
- trmb.** (Trumpet) - 1, 2, 3, 4
- tba.** (Tuba) - 1, 2, 3, 4
- empt.** (Empty)
- vibes** (Vibraphone) - 1, 2
- mar.** (Maracas) - 1, 2
- timp.** (Timpani)
- cb** (Cymbal)

Key features of the score include:

- Time Markers:** 0:48, 0:52, 0:56, 9:00, 9:04, 9:08, 9:12.
- Dynamic Markings:** *mp* (mezzo-piano), *pp* (pianissimo).
- Performance Instructions:** "gradually each player fade out" written above the woodwind staves.
- Section Markers:** Triangles containing the numbers 4 and 5.
- Key Signatures:** Changes from one key signature to another are indicated by sharp and flat symbols.

0
1
2
3

4:12 4:16 4:20 4:24 4:28

breathy +
picc. 1 2
breathy +
fl. 3 4

ppp mp ppp

tba.

cmpt.

Freeley
pno.
mp pp

1
vibes
2

mar.

mar.

timp.

cb

ppp

Denton, TX
Feb. 1992