Title

...after a mountain stream rain (谿山遇雨) for six Chinese instruments and across an ocean, across the land... for laptop ensemble

Author

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UNIVERSITY OF CALIFORNIA, SAN DIEGO

…after a mountain stream rain (谿山遇雨) for six Chinese instruments and *across an ocean, across the land…* for laptop ensemble

A dissertation submitted in partial satisfaction of the requirement for the degree of Doctor of Philosophy

in

Music

by

Jacob David Sudol

Committee in Charge:

Professor Chinary Ung, Chair
Professor Charles Curtis
Professor Diana Deutsch
Professor William Hodgkiss
Professor Miller Smith Puckette

2012

The Dissertation of Jacob David Sudol is approved, and it is acceptable in quality and form for the publication on microfilm and electronically:

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Chair

University of California, San Diego

2012

DEDICATION

I would like to give thanks to the Chai Found Lost Music Ensemble for offering the 2011 Sizhu Competition that *…after a mountain stream rain (谿山遇雨)* won third place in. I also wish to thank Orlando Jacinto Garcia for offering me a full-time position at Florida International University for the 2011-2012 Academic Year.

I would like to thank my committee members for their assistance in my studies, Miller Puckette, Charles Curtis, Diana Deutsch, William Hodgkiss, and especially Chinary Ung, the chair of my committee, for his mentorship in items musical, personal, professional, and spiritual. Lastly, I would like to give special thanks to my parents and especially my wife, Chen-Hui Jen, whose love and support has helped me more than anything during my doctoral studies.

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VITA

Doctor of Philosophy, in Music Composition
University of California San Diego; Professor Chinary Ung, Chair
June 2012

Master of Music, cum laude, in Composition
Schulich School of Music, McGill University; Professor John Rea, Chair February 2007

Bachelor of Music, cum laude, in Composition (Honors College) and Piano Performance
University of Arizona
May 2004

INSTRUCTION

Composition:
Mentors include Chinary Ung, Roger Reynolds, John Rea, Alvin Lucier, David Dunn, Philippe Leroux, Philippe Manoury, Denys Bouliane, Sean Ferguson, Rand Steiger, Yan Maresz, Daniel Asia, and Craig Walsh

Composition Master Classes:
Beat Furrer, Helmut Lachenmann, Fred Lerdahl, Bent Sørensen, and Manfred Stahnke

Keyboards:
Mentors include Aleck Karis, Rex Woods, John Naumann, and Sara Laimon for piano, Takae Ohnishi for harpsichord

PUBLICATIONS

"Scientifically Informed Limit Case Compositions"
Article on compositions by James Tenney, La Monte Young, and Alvin Lucier under consideration for publication in Volume 22 of the *Leonardo Music Journal* (2012)

…wash yourself of yourself
Recording by Keith Kirchoff to be released on upcoming CD *The Electro-Acoustic Piano Volume 2* (Projected Summer 2012)

until we remain suspended…
Text score to be published in poetry and inter-media journal *intersection(s)* (Projected 2012)

Chinary Ung: *Volume 3*
Produced CD release on Bridge Records (December 2011)

Roger Reynolds: *Sanctuary*

Assistant Producer and Audio Processing for DVD released by Mode Records (Fall 2011)

Roger Reynolds: *AngelSpace: Technical Score*

Published by C.S. Peters (Fall 2010)

Second author for the text score of Roger Reynolds's composition *AngelSpace* (2008-2009)

Assembled and programmed an extensive Max/MSP patch that provides the sole content of the composition

"Creating an Inhabiting a Space: Real-Time Algorithms and Performances Issues in Roger Reynolds's *AngelSpace* (2008-2009)"

Published in the proceedings of the 2010 International Computer Music Conference (ICMC)

Presented paper along with the premier of *AngelSpace* at the 2010 ICMC

Roger Reynolds listed as second author

"Analogue to Digital: Authenticity Versus Sustainability in Stockhausen's *Mantra* (1970)"

Published in the proceedings of the 2008 ICMC

Co-author of paper with Xenia Pestova and Mark T. Marshall

Times Fixtures

Published at McGill University and registered in the Canadian National Library (2007)

Masters' Thesis involving the score, recording, electronics, and essay analysing the work completed in partial fulfilment of a Masters' of Music at McGill University

EMPLOYMENT

Assistant Professor of Music Technology, Florida International University (FIU) (Starting August 2012)

Visiting Lecturer of Music Technology, FIU (August 2011 – May 2012)

Teaching Assistant, University of California San Diego (UCSD) (September 2009 – June 2011)

Research Assistant for Roger Reynolds, UCSD (September 2007 – June 2009)

Digital Composition Studio Lab Assistant, McGill University (June 2005 – May 2007)

Teaching Assistant, McGill University (August 2004 – May 2006)

COURSES TAUGHT

Music Technology Masters' Thesis Research (FIU, Spring 2012)

Electronic Music Lab 4 (FIU, Spring 2012)

Electronic Music Lab 2 (FIU, Spring 2012)

Music Technology Senior Research (FIU, Fall 2011 – Spring 2012)

Laptop Ensemble (FIU, Fall 2011 – Spring 2012)
Electronic Music Lab 3 (FIU, Fall 2011)
Electronic Music Lab 1 (FIU, Fall 2011)
Music, Science, and Computers (UCSD, Spring 2011)
Sound Editing and Mixing Techniques (UCSD, Winter 2011)
Acoustics (UCSD, Fall 2009 and Fall 2010)
Music 101c, Tonal Harmony and Analysis (UCSD, Spring 2010)
Music 101b, Introduction to Tonal Harmony and Analysis (UCSD, Winter 2009)
Advanced Digital Composition Studio Techniques (McGill University, Fall 2007 – Spring 2008)
Elementary Harmony (McGill University, Spring 2007)
Melody and Counterpoint (McGill University, Fall 2006)

PUBLIC TALKS

"Personal Aesthetics, *…approaching a prayer*, and *…after a mountain stream rain* (谿山遇雨)"
One-hour presentation on my personal aesthetics and how they manifest themselves in two recent compositions, given at the New World Music College (March 2012)

"Personal Aesthetics, Chinese Musical Traditions, and *…after a mountain stream rain* (谿山遇雨)"
One-hour presentation on how a combination of my personal compositional aesthetics with an understanding of the musical and poetic traditions of traditional and contemporary music for Chinese instruments, given at the FIU Composition Forum (January 2012)

"Personalizing Spectral Techniques and *…approaching a prayer*"
One-hour presentation of my personally developed spectral software and composition *…approaching a prayer*, given as an invited guest lecture at the 2011 Florida Electro-Acoustic Student (FEASt) Festival in Miami, FL (November 2011)

"Personal Aesthetics and *Wind in Spring*"
One-hour presentation on my personal compositional aesthetics and my composition *Wind in Spring* at the FIU Composition Forum (October 2011)

"Explorations in Real-Time Computer-Assisted Stochastic and Variable Forms"
Two-hour presentation on Roger Reynolds's *AngelSpace* and my recent works for instruments and live electronics, given as part of a residency at National Chiao Tung University (NCTU), Taiwan (March 2011)

"Understanding and Interpreting Contemporary Compositions by Studying Works for Piano and Electronic Sounds"
Two-hour presentation for music graduate students with composer and pianist Chen-Hui Jen discussing music from our concert for piano and electronics, as part of a residency at NCTU, Taiwan (March 2011)

"Generating and Testing an Interpretive Approach to Spatializing Varèse's Material for Acoustic Instruments"
Two-part one-hour talk presented as part of the "Varèse: Connections and Extensions" Symposium at UCSD (December 2010)
"Reflections, Ghosts, Cascades, and Suspension: The Recent Music of Jacob Sudol"
Ninety-minute talk presented at Stanford University (November 2010)
Two-hour talk presented at the UCSD Graduate Composition Area biweekly focus (May 2010)
"Creating an Inhabiting a Space: Real-Time Algorithms and Performances Issues in Roger Reynolds's*AngelSpace* (2008-2009)"
Thirty-minute presentation at the 2010 ICMC (June 2010)
"Compositional Procedures in *Time Fixtures*: A Composition for Chamber Ensemble and Interactive Hexaphonic Electronics,"
Two-hour talk presentation for the Canadian Music Research Group at McGill University (March 2007)
"What Will Remain New?"
Structured and moderated a panel discussion with composers and performers Mark Couroux, Justin Mariner, and Michael Oesterle in Montréal (March 2006)

COMPOSITIONS AND PERFORMANCES (SELECTED FROM 2005 ON)

across an ocean, across the land… (2011)
For laptop ensemble (four performers)
Composed for the Florida Laptop and Electro-Acoustic (FLEA) Ensemble
Solo version premiered by the composer at Art Basel, Miami (December 2011), and at the Gibson Gallery, Miami (January 2012)
Autonomous Variations 2 (2011)
Collaborative composition with David Dunn, Gustavo Matamoros, and FLEA for automated chaotic systems, field recordings, and live digital signal processing
Premiered at the GAB Gallery, Miami (November 2011), performed at the Gibson Gallery, Miami (January 2012)
New version with video by Jacek Kolasinski premiered at New Music Miami (April 2012)
Having Never Written a Note for Laptop Ensemble (2011)
For laptop ensemble (four to eight performers)
Composed for the FLEA Ensemble, premiered at the Miami Beach Sleepless Night (November 2011), performed at Art Basel, Miami (December 2011), and at the Gibson Gallery, Miami (January 2012)
…after a mountain stream rain (谿山遇雨) (2011)
For six traditional Chinese instruments

Received Third Place in the Chai Found Lost Music Music Workshop Formosa Landscape/2011 Sizhu Music Composition Contest
Recorded for CD release and performed in Taipei, Taiwan for the final round of the 2011 Sizhu Music Composition Contest (November 2011)

I see two reflections of myself in the mirror (2011)
For flute, piano, and live electronics
Commissioned by Canadian/Ukrainian flute performer Solomiya Moroz and pianist Keith Kirchoff
Recorded at STEIM in Amsterdam, Netherlands (April 2011)
Performed at the Cluster New Music Festival in Winnipeg, Canada (March 2012)

Wind in Spring (2010-2011)
For alto flute and live electronics
Commissioned by the British flute performer, Carla Rees
Performed and recorded at UCSD (February 2011)
To be performed by the New York ensemble Wet Ink (Concert Season 2011 – 2012)

From Silence, I Rise (2010)
For *zheng* and live electronics
Commissioned by Taiwanese *zheng* performer, Yi-Chieh Lai
Performed at UCSD (December 2010)

Falling (2010)
100-minute multimedia work for toy piano, sine wave, and projected video stills
Shortened version performed by the composer at UCSD (November 2010)

Four Broken Reflections (2010)
Four duos for two bass clarinets, two violins, two accordions, and two tubas
Commissioned by the Machine Project for the Little William Theater/ Festival of New Music at the Hammer Museum (University of California Los Angeles)
Performed repeatedly at the Hammer Museum (August – November 2010)

I lay my heart deep in the earth (2010)
For soprano sax, percussion, electric guitar, and live electronics
Commissioned by the UCSD Ensemble-In-Residence program
Recorded by the composer at UCSD (May 2010)

"*…wash yourself of yourself*" (2009-2010)
For piano and live electronics
Performed twice with New Zeeland/Canadian pianist Xenia Pestova and the composer (electronics) at UCSD and at the wulf in Los Angeles and twice by Chen-Hui Jen (piano) and the composer at

UCSD and Chapman University (2009-2011)
Performed by Chen-Hui Jen and the composer at CalArts and Mills University as part of the California Electronic Music Exchange (2011)
Performed by Keith Kirchoff at the Hochschule für Musik und Theater "Felix Mendelssohn Bartholdy" in Leipzig, Germany (October 2011)
Recorded for CD release by Keith Kirchoff (November 2011)
Performed by Chen-Hui Jen and the composer in a recital at the FIU Miami Beach Urban Studios (MBUS) (February 2012)

…approaching a prayer (2009-2010)
For piano and interactive electronics
Performed by Chen-Hui Jen (piano) and the composer (electronics) four times at UCSD and once at Chapman University, Orange, CA (2010)
Performed by Chen-Hui Jen and the composer at the Taiwan National Recital Hall and NCTU (2011)
Performed by Chen-Hui Jen and the composer at the FIU FEASt Festival, Miami, FL (2011)
Performed by Chen-Hui Jen and the composer in a recital at the FIU MBUS (February 2012)
Performed by the composer at the INTER/actions symposium on electronic music in Bangor, North Wales and the 2012 New Music Miami Festival (April 2012)

until we remain suspended… (2009)
For Tibetan bells and live electronics
Completed while in residency at the Atlantic Center for the Arts
Performed by the composer twice at the Atlantic Center for the Arts, New Smyrna Beach, FL; at the MATA Festival, NYC; twice at UCSD; twice at Space4Art, San Diego, CA; once at the wulf; and at the 2012 New Music Miami Festival (2009-2011)
Installation version premiered at the FIU FEASt Festival, Miami, FL (November 2011)
Installation version premiered at the Cluster Festival, Winnipeg (March 2012)

The Space Between (2008)
For mezzo-soprano, trio, and live electronics
Performed by UCSD graduate performers at Studio A, UCSD (October 2008)

"Longing, we say" (2007)
For violin and violoncello
Performed by UCSD graduate performers at Studio A, UCSD (January 2008)

Sing/Lose (2007)
- For chamber ensemble (15 players)
- Commissioned by the Nouvel Ensemble Moderne (NEM) for the 2007 Domain Forget Festival of New Music
- Performed by the NEM with conductor Lorraine Vaillancourt in Charlevoix, Québec (August 2007)

Inner Music (2006-2007 rev. 2009)
- For percussion, piano, harpsichord, and hexaphonic interactive electronics
- Commissioned by the Contemporary Keyboard Society (CKS)
- Performed twice by the CKS at Tanna Schulich Hall, McGill University, Montréal, Québec (March 2007); revised version performed by UCSD graduate performers at UCSD (May 2009)

Time Fixtures (2005-2006)
- For chamber ensemble (11 players) and hexaphonic interactive electronics
- Composed in fulfilment of the Composer-in-Residence for the McGill Contemporary Music Ensemble (CME), with the assistance of the McGill Digital Composition Studio
- Performed by the CME with conductor Denys Bouliane at Pollack Hall, McGill University, Montréal, Québec (April 2006)

Resonances (2004-2006 rev. 2010-2011)
- For metallic percussion and interactive electronics
- Performed by Fernando Rocha as part of the McGill Digital Composition Studio 2004-2006 concert series at Pollack Hall (March and November 2005)
- Revised version recorded by Nathan Davis (January 2011)

ABSTRACT OF THE DISSERTATION

…after a mountain stream rain (谿山遇雨) for six Chinese instruments and *across an ocean, across the land…* for laptop ensemble

by

Jacob David Sudol

Doctor of Philosophy in Music

University of California, San Diego, 2012

Professor Chinary Ung, Chair

…after a mountain stream rain (谿山遇雨) for six Chinese instruments was composed for the Chai Found Music Workshop Formosa Landscape/2011 Sizhu Music Composition Contest, for which it won third place. *across an ocean, across the land…* for laptop ensemble was composed for the Florida International University Laptop and Electro-Acoustic Arts (FLEA) Ensemble that I direct. Each of these two compositions uses strongly contrasting media and technical means to explore some of my primary aesthetic interests from different angles.

…after a mountain stream rain (谿山遇雨) solely uses acoustic instruments and carefully notated music. For this piece, I studied traditional Chinese musical culture and aesthetics starting with ancient music for the guqin and continuing through to contemporary works for Chinese instruments. This cultural background serves as the basis for the music's focus on a nature as well as the symbolic meanings of the sounds and their relationships. In addition, when writing the music I applied certain stochastic algorithms without the aid of a computer to intuitively create a sense of multiple emerging phenomena.

across an ocean, across the land… uses solely electronically produced sounds and a flexible graphic score. The sound sources come from recordings and transformations of Tibetan bells and a gigantic tam-tam. In this piece, the performers control stochastic algorithms that determine how the computer will generate the sonic results. As a result, during performances, the performer and audience constantly engage with different manifestations of the algorithms. Structurally, the work focuses on how one can observe the relationship of similar materials interacting through many different overlapping layers of tempi and register.

Although sonically different, both pieces use the same primary harmonic fields. In addition, both pieces focus on my interest on the emergent phenomena that result from the interaction of simple scientifically and culturally informed structures or behaviors. Finally, in sum, both works also reflect my strong aesthetic interest in representing my own personal interactions with the spiritual in its many external, internal, and transforming manifestations.

EXTENDED PROGRAM NOTE FOR *…AFTER A MOUNTAIN STREAM RAIN*

(谿山遇雨)

The composition *…after a mountain stream rain* (谿山遇雨) draws its inspiration from a trip I took with my wife, Chen-Hui Jen, and some of her family to Xitou, Taiwan in July 2010. The composition represents a sonic retelling and the process of remembering the first walk we took after arriving at our destination. Musically, the works draws inspiration from traditional Chinese musical culture. In addition, the work makes use of algorithms models based on the movement of particles in fog and rain, how various animals sounds interact in nature, as well as how a mountains rises and falls.

The first part, titled "Remembering a high mountain forest – mists, life, rain… (一：山林之憶 - 嵐、野生、時雨...)" that lasts approximately one half of the composition, evokes the high mountain forest in Xitou. This begins with rubbing and breath sounds that represent both literal and metaphorical or nostalgic mists that are similar to the rubbing sounds featured in the classical *guqin* composition *Mists over Xiao and Xiang Rivers* (瀟湘水雲). In *…after a mountain stream rain* these rubbing mist-like sounds occasionally go along with pitch bends in the same way they do a on *guqin*. However, as the music progresses, these mist-like sounds begin to develop new identities such as the winds that precede an afternoon Summer monsoon rain and the scratching of forest locusts. At the same time as these sonic transformations,

pitches begin to arrive and gradually begin to descend like the moisture of a pre-sunset rain shower.

The second section of the composition titled "A clearing in the forest – rising mountains, penetrating light, drifting heavens… (撥雲出森 - 昇岳、透光、浮穹…)" evokes a grand view of clouds evaporating and lifting from the edges of the mountains near Xitou. In this passage, the plucking strings play long rising lines to represent the majestic rising mountains; the *sheng* constantly plays a series of large chords to represent the size of these mountains; and a *bandi* and *gaohu* play high glistening lines to represent shrill mountain locusts, the quickly moving clouds lifting above and hovering over the mountains, and the bright light that breaks through the clouds. In the third section titled "Light recedes into itself – to early night, memories, soft winds, bells (迴光 - 返於夜初、記憶、和風、與鐘聲)" gradually some pitch sounds return to mist-like sounds. This represents the gradual darkening and incoming fog that accompanies a setting sun as well as the gradual receding of the material into memory. Finally, in front of a subtler and rarified twilight version of the musical material from the beginning of the second half, like in the end of traditional compositions for *guqin*, the strings play a few harmonies and multiphonics that represent both stars coming out and the sounds of rare religious bells ringing from distant mountain temples.

I composed *…after a mountain stream rain* (谿山遇雨) for the Chai Found Music Workshop Formosa Landscape/2011 Sizhu Music Composition Contest, for which it won third place, in the Spring and Summer of 2011 in La Jolla, California and

Miami, Florida. The premiere and recording was conducted by 黃正銘 who leads the Chai Found Music Workshop with the performers Hsien Lin (Zheng), Lung-Yi Huang (Sheng), Chih-Yuan Liu (Erhu), Ya-Hui Wu (Di), and Mei-Yu Sue (Pipa). The work is dedicated to my lovely wife, Chen-Hui Jen.

…after a mountain stream rain

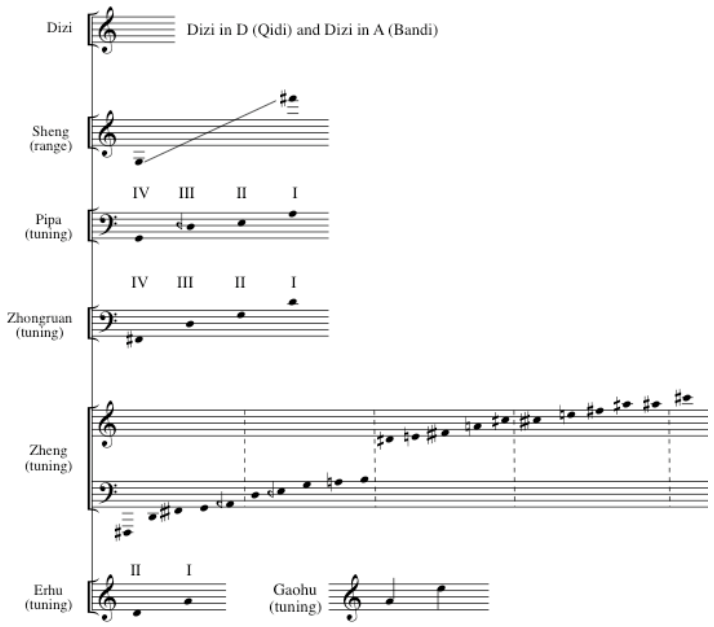
谿山遇雨

For *dizi*, *sheng*, *pipa*, *zhongruan*, *zheng*, and *erhu*

Jacob David Sudol

雅各. 大衛. 司徒

Instrumentation/Tunings:



Stage Setup:

Zhongruan *Zheng*

Sheng *Pipa*

Dizi *Erhu/Gaohu*

Conductor

Program Note:

The composition …*after a mountain stream rain* (谿山遇雨) draws its inspiration from a trip I took with my wife, Chen-Hui Jen, and some of her family to Xitou, Taiwan in July 2010. The composition represents a sonic retelling and the process of remembering the first walk we took after arriving at our destination.

The first part, approximately one half of the composition, evokes the high mountain forest in Xitou. This begins with rubbing and breath sounds that represent both literal and metaphorical or nostalgic mists that are similar to the rubbing sounds featured in the classical *guqin* composition *Mists over Xiao and Xiang Rivers* (瀟湘水雲). In …*after a mountain stream rain* these rubbing mist-like sounds occasionally go along with pitch bends in the same way they would on the *guqin*. However, as the music progresses, these mist-like sounds begin to develop new identities such as the winds that precede an afternoon Summer monsoon rain and the scratching of forest locusts. At the same time as these sonic transformations, pitches begin to arrive and gradually begin to descend like the moisture of a gentle pre-sunset rain shower.

The second half of the composition evokes a grand view of clouds evaporating and lifting from the edges of the mountains near Xitou. In this passage, the plucking strings play long rising lines to represent the majestic rising mountains; the *sheng* constantly plays a series of large chords to represent the size of these mountains; and a *bandi* and *gaohu* play high glistening lines to represent the quickly moving clouds lifting above and hovering over the mountains. As this section moves on, gradually the some of pitch sounds return to mist-like sounds. This represents the gradual darkening and incoming fog that accompanies a setting sun. Finally in the end, in front of a subtler and rarified twilight version of the musical material from the beginning of the second half, the strings play a few harmonies and multiphonics that represent both stars coming out and the sounds of rare religious bells ringing from distant mountain temples.

I composed …*after a mountain stream rain* (谿山遇雨) for the Chai Found Music Workshop Formosa Landscape/2011 Sizhu Music Composition Contest, for which it won 3rd place, in the Spring and Summer of 2011 in La Jolla, California and Miami, Florida. The work is dedicated to my lovely wife, Chen-Hui Jen.

-Jacob David Sudol
September 13, 2011 (Miami, Florida)

Performance Notes:

General Notes:

• SCORE IS WRITTEN AT THE SOUNDING PITCH, NO TRANSPOSITIONS ARE PROVIDED

• All instruments should be slightly amplified in performance, but not so much that the amplified sound overpowers the acoustic sound. In addition, the amplified levels of the strings should be slightly louder than they would be in an unamplified setting so that the subtle rubbing and other sounds can better match the levels of the winds than would be possible in an unamplified setting.

• Multiphonics on the *pipa*, *zhongruan*, and *zheng* are produced by plucking string when the left hand applies harmonic pressure with the left hand to specific positions between harmonic nodes. The resulting sound should be similar to that of harmonics; however, with a multiphonic, rather than one predominant pitch sounding a collection of multiple inharmonic pitches should sound simultaneously.

• Harmonics and multiphonics on *pipa*, *zhongruan*, and *zheng* should be played with a percussive quality so that they slightly resemble bell sounds. Specifically, harmonics should be plucked on the on *pipa*, *zhongruan*, and *zheng* with the same technique that one plucks harmonics on the *guqin*.

Special Notation for All Instruments:

𝄳 = Lower the pitch by approximately a quarter tone (50 cents)

𝄲 = Raise the pitch by approximately a quarter tone (50 cents)

♯ = Raise the pitch by approximately three quarter tone (150 cents)

↓ = Lower the pitch by approximately an eighth of a tone (25 cents)

↑ = Raise the pitch by approximately an eighth of a tone (25 cents)

senza misura = Literally "unmeasured" – Play the material under the following bracket freely, without clear divisions on the beat.

= Gradually increase the tremolo speed.

= Gradually decrease the tremolo speed.

= Create a pitch vibrato at a rate and depth corresponding to the graphical representation placed over the note or notes.

= Bend the string to the indicated position or positions.

A slur indicates that the bent notes <u>are not</u> plucked or articulated.

Specific Notation for Specific Instruments:

Dizi:

■ / □ = Focus the breath towards the flute with the mouth removed from the mouthpiece and fingering the indicated note. The resulting sound should resemble a breath noise that has just the slightest coloration of pitch and timbre from the *dizi*.

'tz' = Speak the sound contained within ' ' with the mouth just outside the flute as for the symbol described directly above.

… = Keep speaking the last indicated sound towards the flute on successive notes until either a new sound appears above a note-head or a normal note-head appears.

fltz. = *Fluttertongue*

ord. = Ordinary playing style, as distinguished from *fluttertongue*

ord. –> *fltz.* –> ord. = Gradually transition from ordinary playing style to *fluttertongue* and back to the ordinary playing style.

***Sheng*:**

■ / □ = Blow towards the instrument with no keys depressed. The resulting sound should be a slightly colored breath sound. A three-line staff accompanying this symbol indicates that the resulting sound should have no clearly quantifiable pitch-like qualities.

***Pipa* and *Zhongruan*:**

■ / □ = Rub the surfaces of the indicated string or strings. For the *pipa* and left hand of the *zhongruan* rub the string(s) with at least two fingers held perpendicular to the fingerboard. When this symbol is used for the right hand of the *zhongruan* performer, rub the edge of the plectrum on the indicated string or strings. The lines following this symbol indicate the general position where one should move his or her fingers over the fingerboard. A three-line staff accompanying this symbol indicates that the resulting sound should have no clearly quantifiable pitch-like qualities and that the finger positions are approximate.

× / ⊗ = Pluck the indicated string or strings at the indicated note while muting the string with the left hand. Place a second finger behind the indicated note in order to suppress any harmonic sound that the muted position might otherwise produce.

▲ = Mute and pluck the indicated string or strings above the fingerboard to create a high woodblock sound. A three-line staff accompanying this symbol indicates that the resulting sound should have no little pitch-like qualities and that the finger position(s) are approximate.

◆ / ◇ = Play a harmonic or multiphonic at the indicated position on the string or strings.

0 = Play an open string when this symbol is placed above a note.

***Zheng*:**

■ / □ = Rub the surface of multiple strings with the palm and fingers of the indicated hand. The lines following these note-heads provide indicate how far one should move on the string, as well as when one should change the direction of the movement. A three-line staff and percussion clef accompanying this symbol also indicate that the resulting sound should have no clearly quantifiable pitch-like qualities.

poco sul pont. = Play the indicated note or notes plucking or bowing near the edge of the right side of the *zheng*'s bridge. Unless indicated, all notes sould otherwise be plucked in the normal position on the string.

'tz' = Speak the sound contained within ' ' with the mouth just outside the flute as for the symbol described directly above.

… = Keep speaking the last indicated sound towards the flute on successive notes until either a new sound appears above a note-head or a normal note-head appears.

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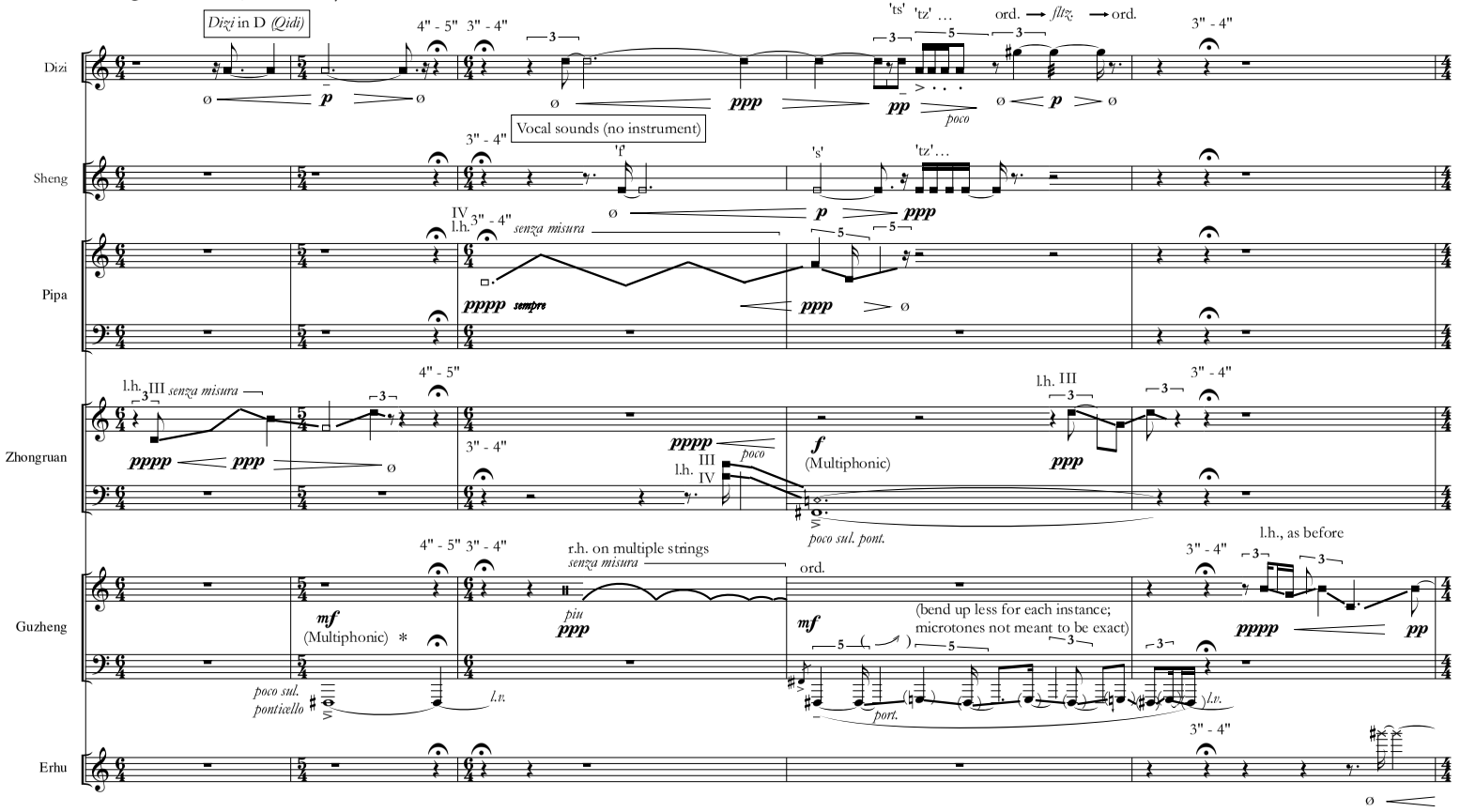
…after a mountain stream rain

谿山遇雨

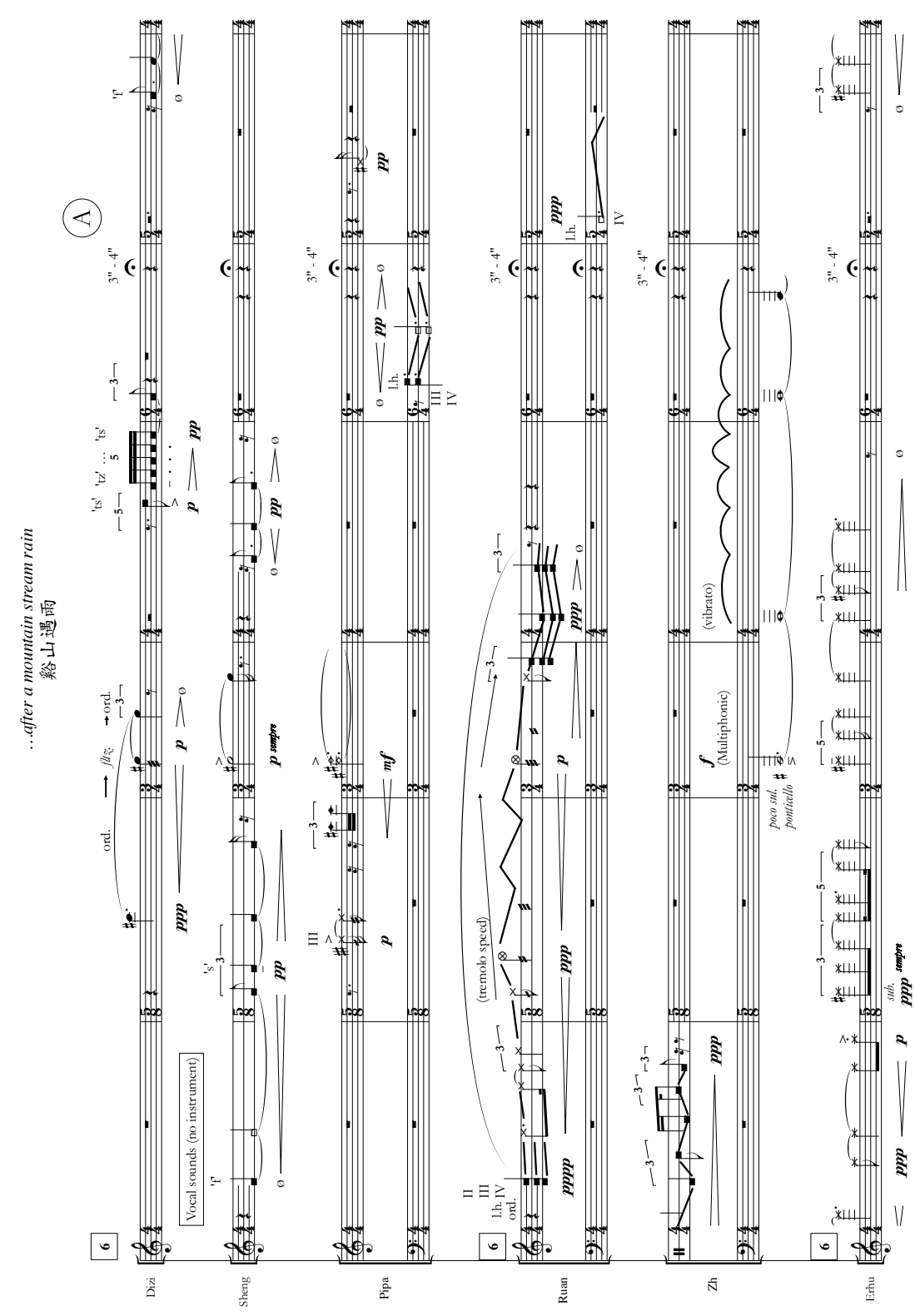
Jacob David Sudol
雅各. 大衛. 司徒

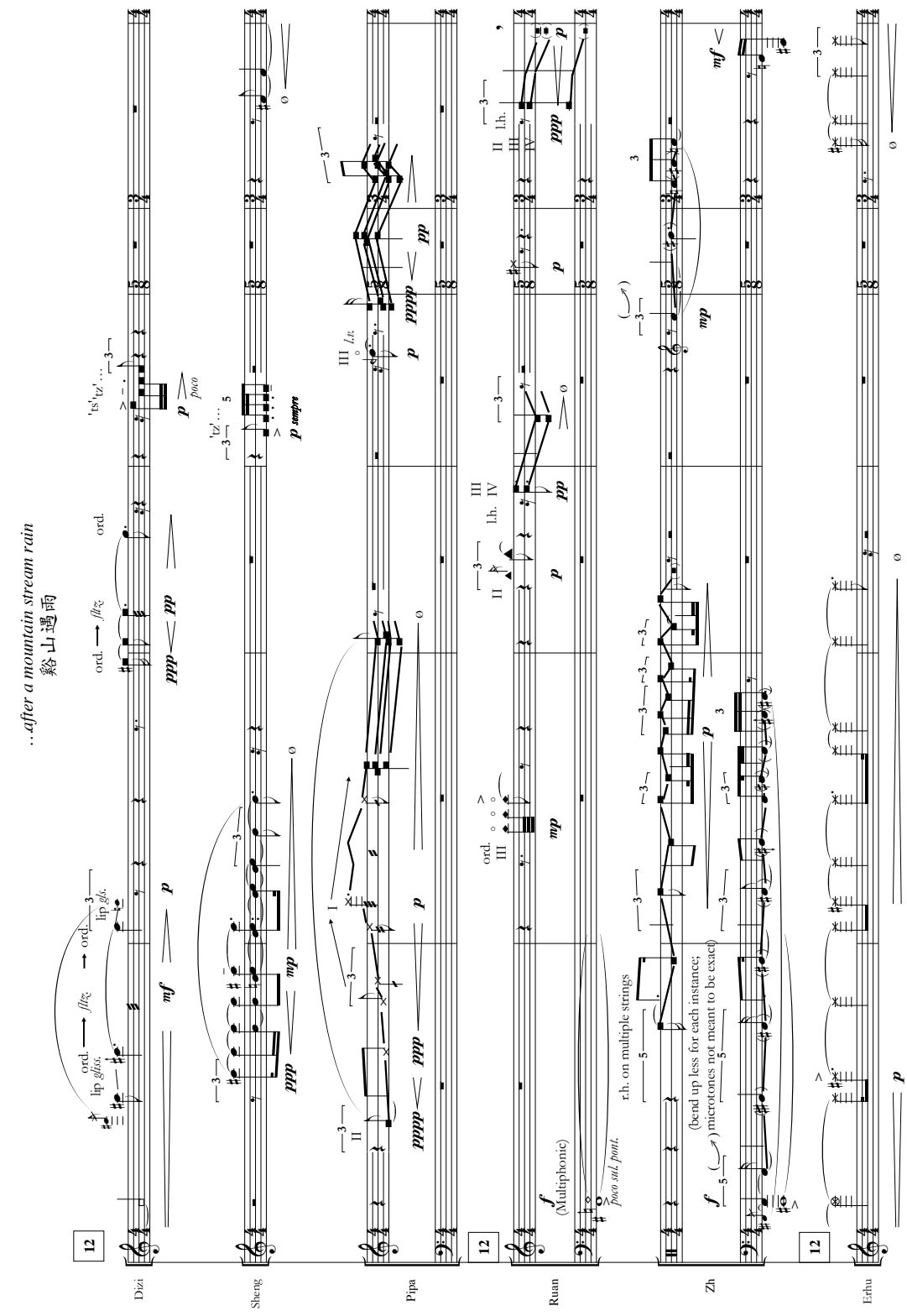
I. Remembering a high mountain forest – mists, life, rain…
一：山林之憶 - 嵐、野生、時雨...

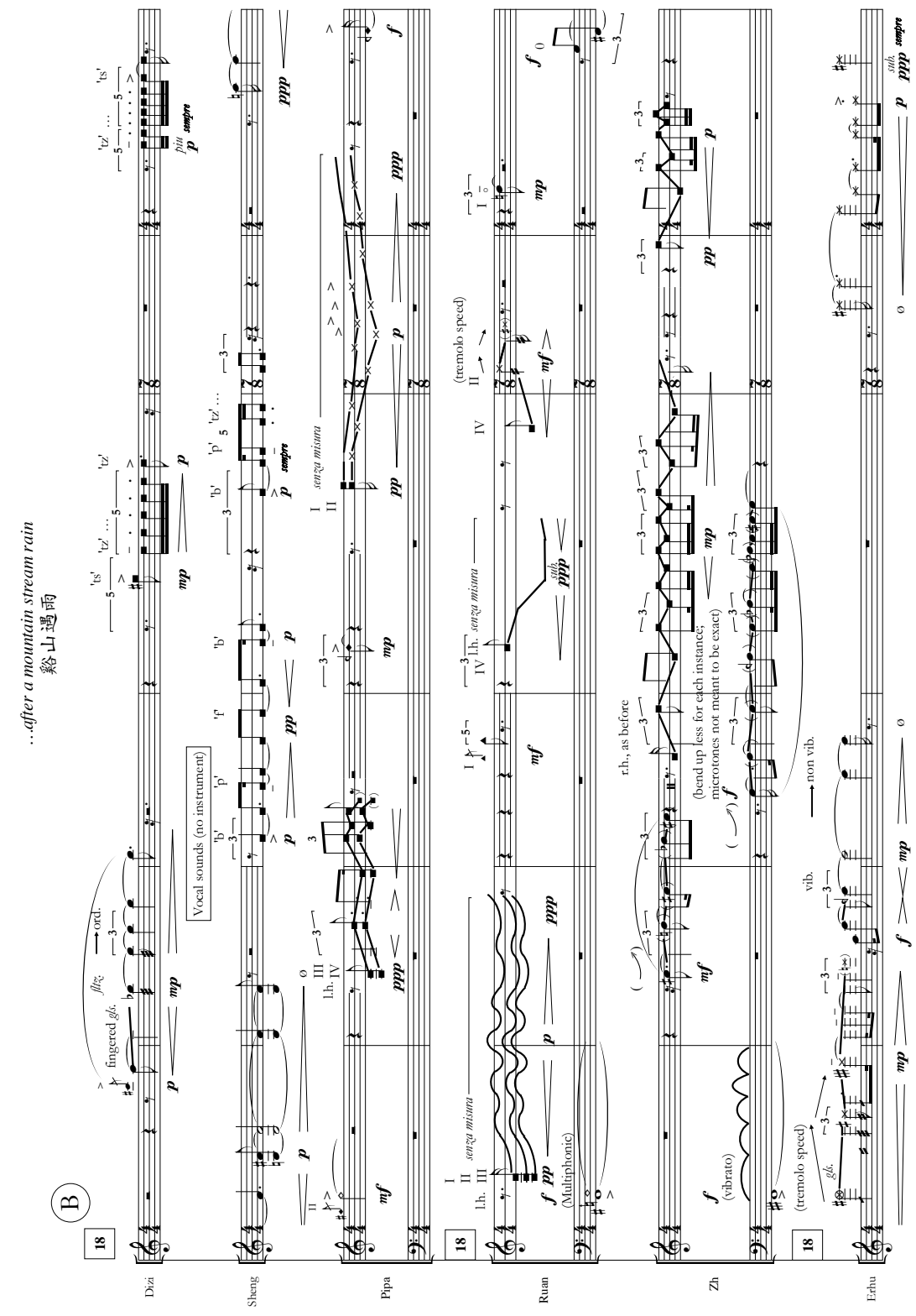
ca. ♩ = 56 flexible, move naturally

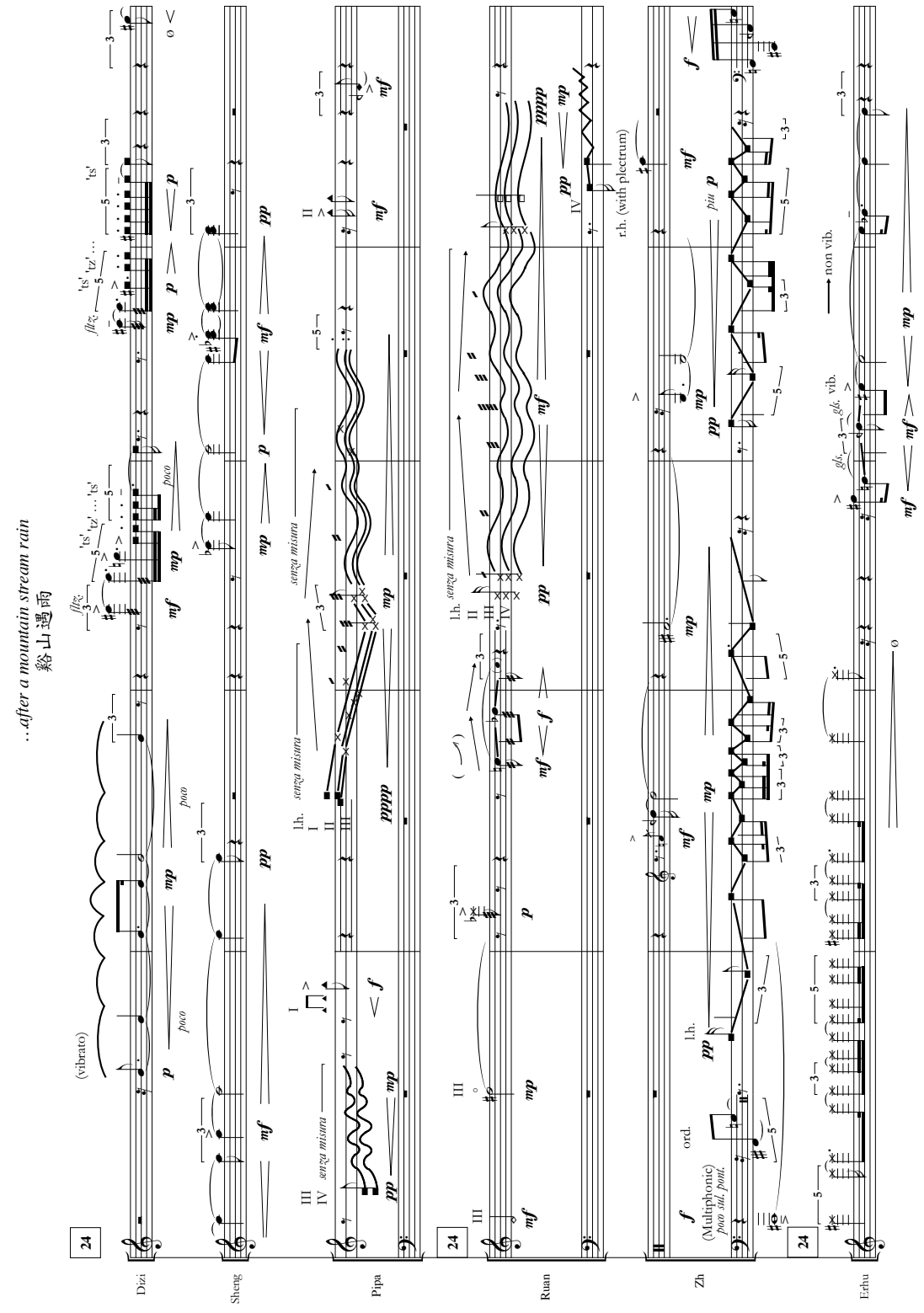


* Consistantly use an inharmonic node that produces a multiphonic that is rich with many overtones


...after a mountain stream rain
谿山過雨
A
Vocal sounds (no instrument)
(tremolo speed)
(vibrato)
(Multiphonic)
poco sul. ponticello
3" - 4"
Dizi
Sheng
Pipa
Ruan
Zh
Erhu

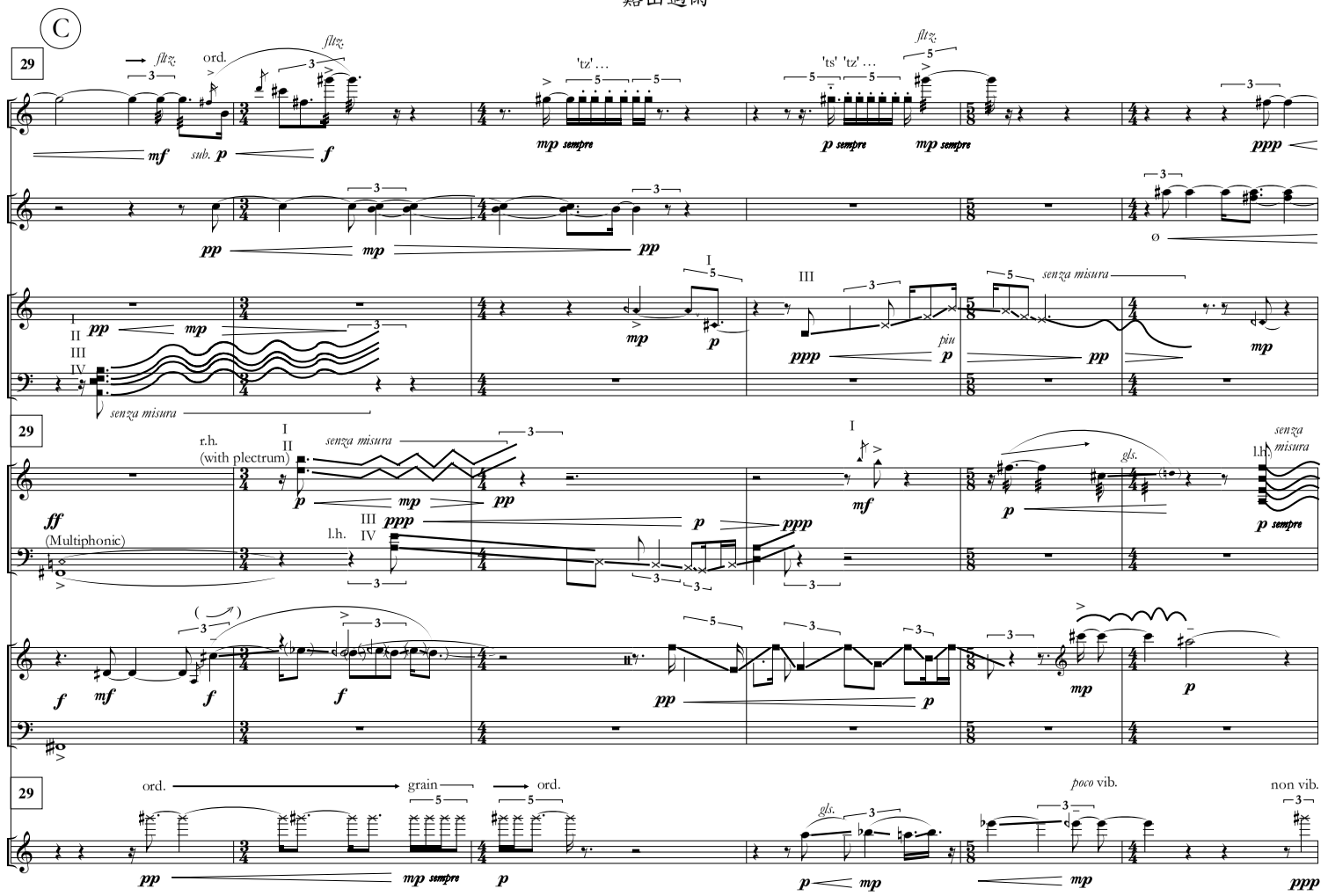

...after a mountain stream rain
給山過雨
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
12
(Multiphonic)
(bend up less for each instance;
) microtones not meant to be exact)
r.h. on multiple strings
l.h.

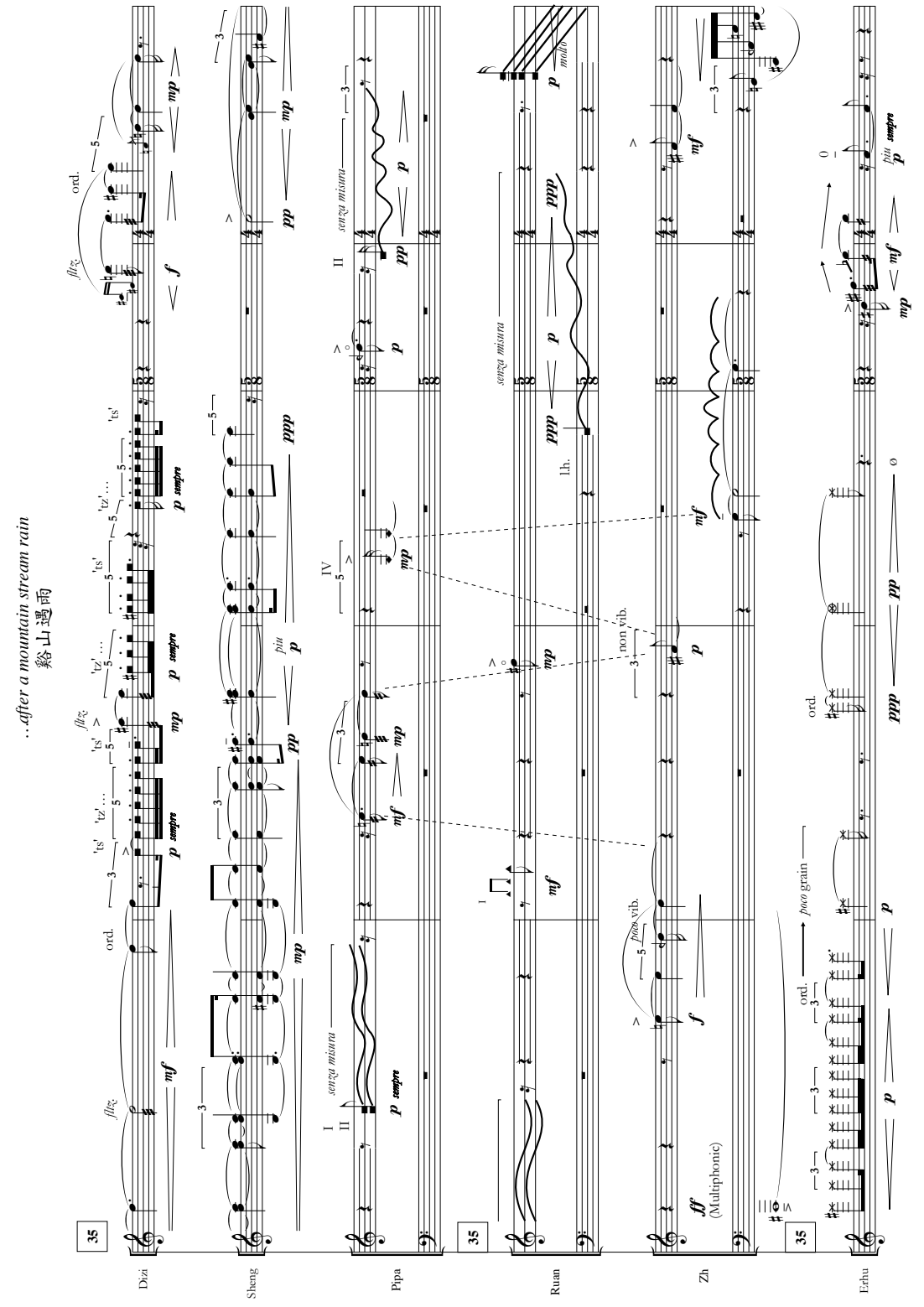

...after a mountain stream rain
谿山遇雨
B
18
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
fingered gli.
ord.
Vocal sounds (no instrument)
senza misura
(tremolo speed)
(Multiphonic)
r.h., as before
(bend up less for each instance; microtones not meant to be exact)
(vibrato)
vib.
non vib.
sempre

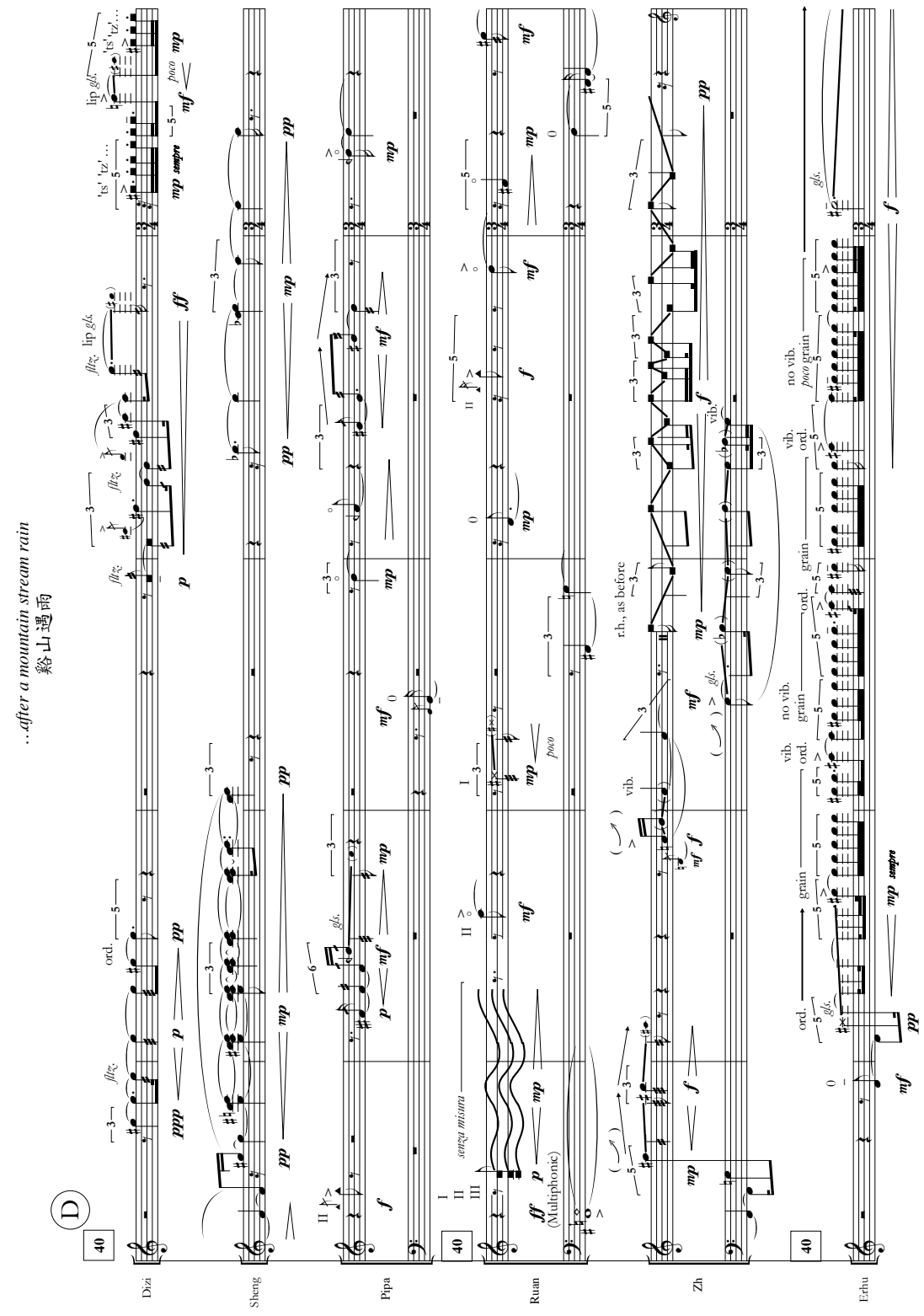

...after a mountain stream rain
谿山遇雨
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
(vibrato)
senza misura
(Multiphonic)
poco sul. pont.
ord.
l.h.
r.h. (with plectrum)
non vib.
gli. vib.

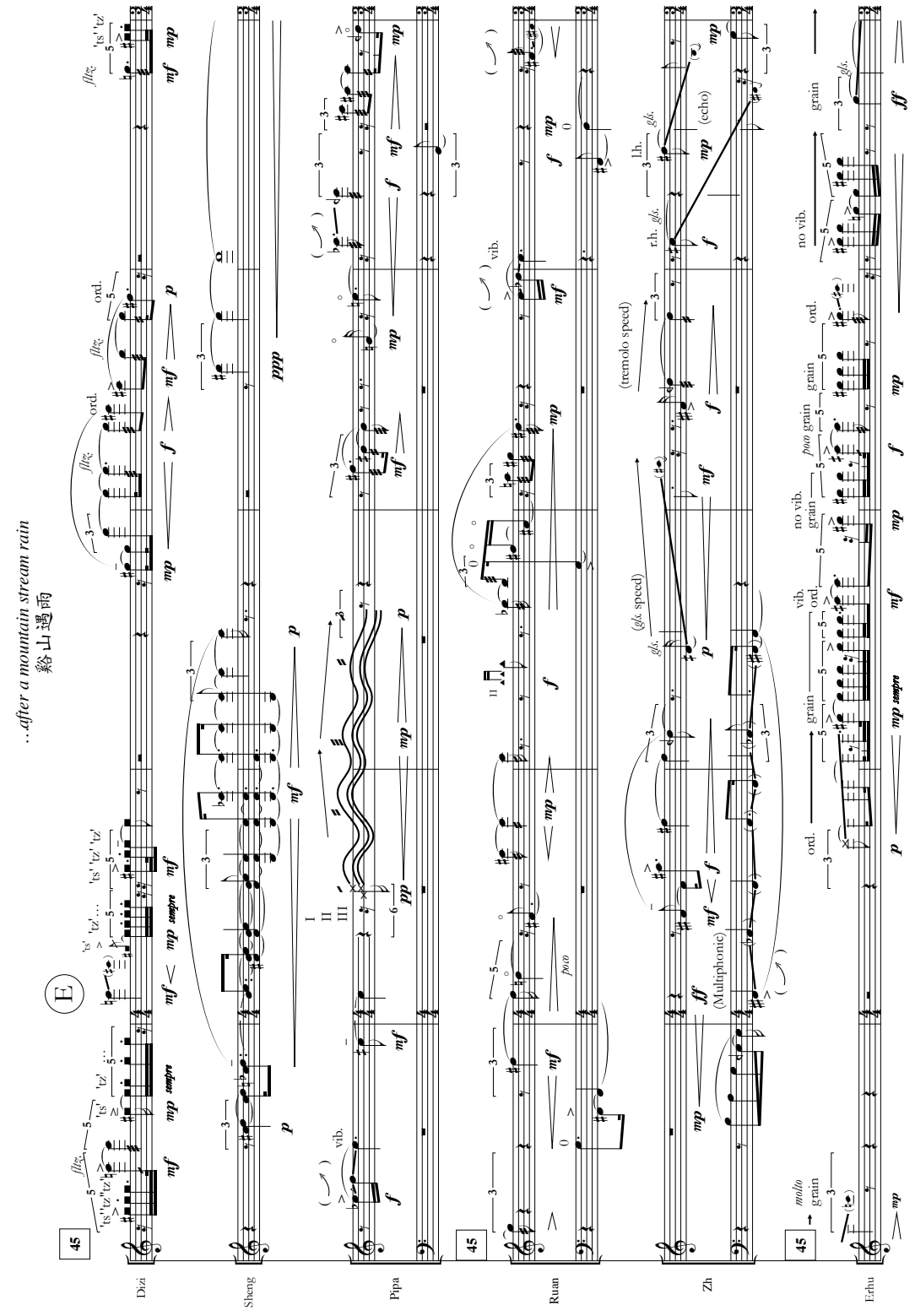
..after a mountain stream rain

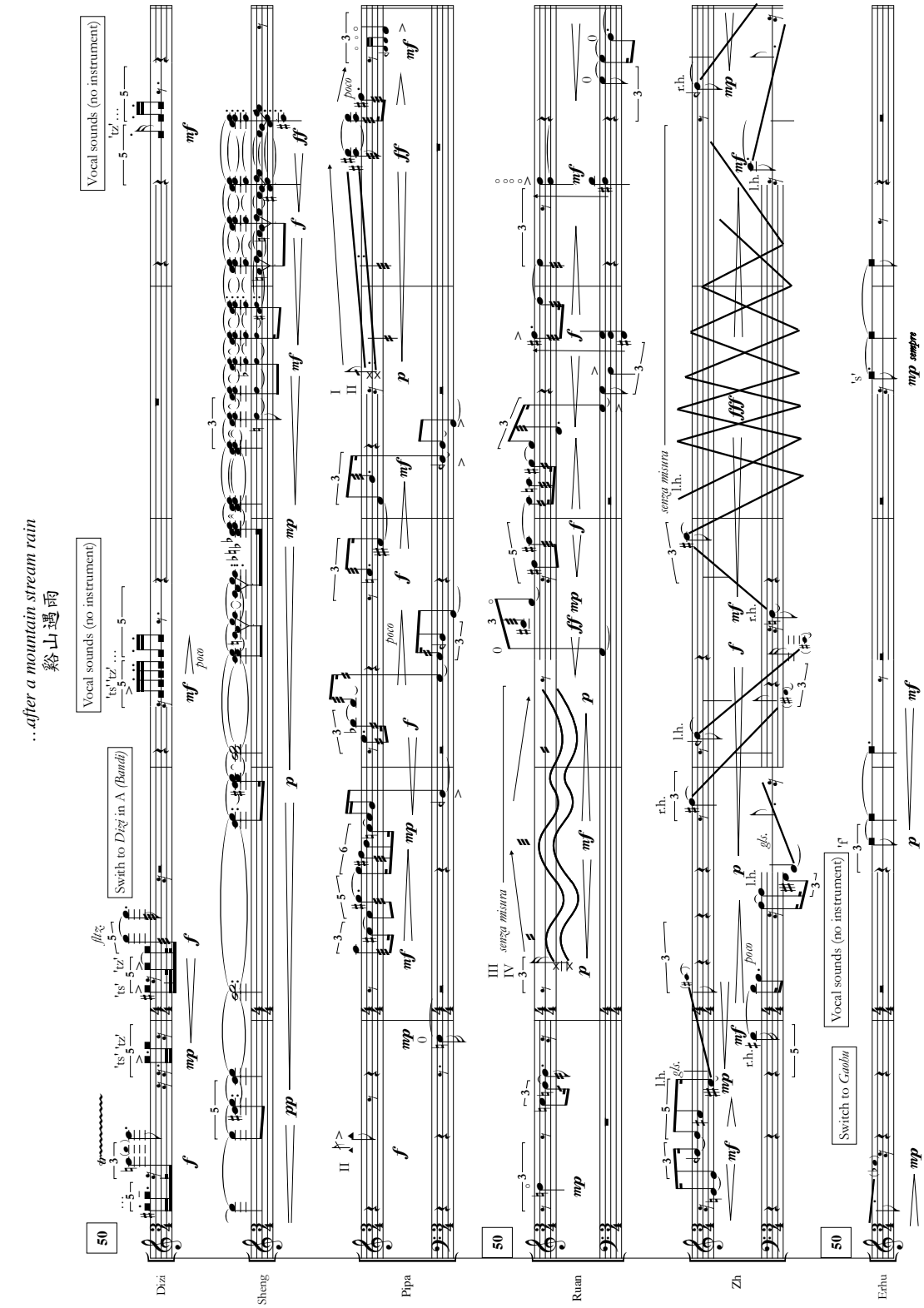
谿山遇雨




...after a mountain stream rain
谿山遇雨
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
35
ord.
senza misura
non vib.
l.h.
molto
(Multiphonic)
pizz.
vib.
poco grain
sempre
più


...after a mountain stream rain
谿山遇雨
D
40
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
(Multiphonic)
senza misura
r.h., as before
vib.
no vib.
ord.
grain
lip gl.
'ts' 'tz' ...


...after a mountain stream rain
谿山遇雨
E
45
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
(Multiphonic)
(tremolo speed)
(echo)
no vib.
vib.
ord.
grain
r.h.
l.h.

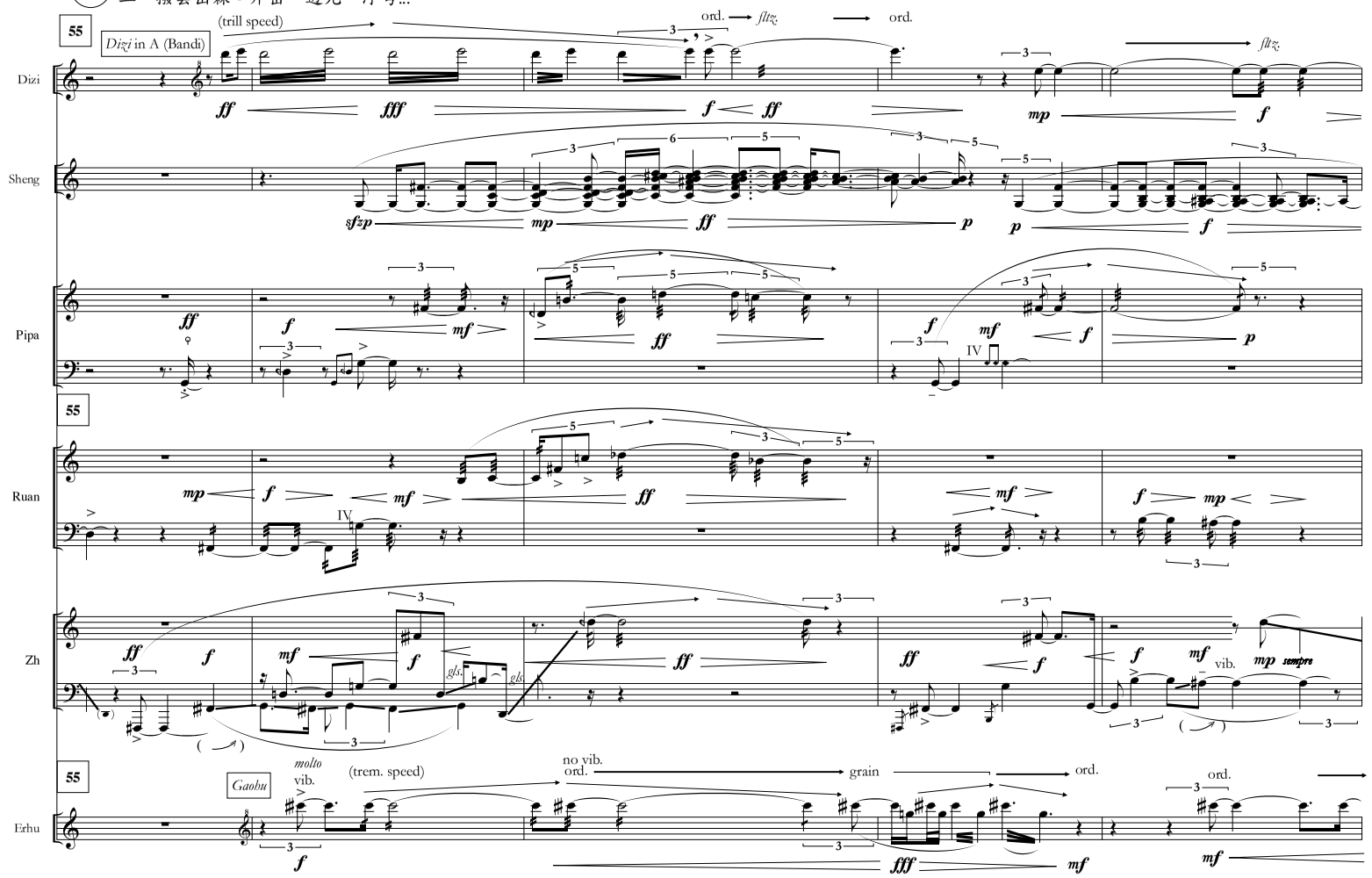

...after a mountain stream rain
谿山過雨
Vocal sounds (no instrument)
Switch to Dizi in A (Bandi)
Vocal sounds (no instrument)
Switch to Gaohu
Vocal sounds (no instrument)
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
senza misura
poco
mp sempre

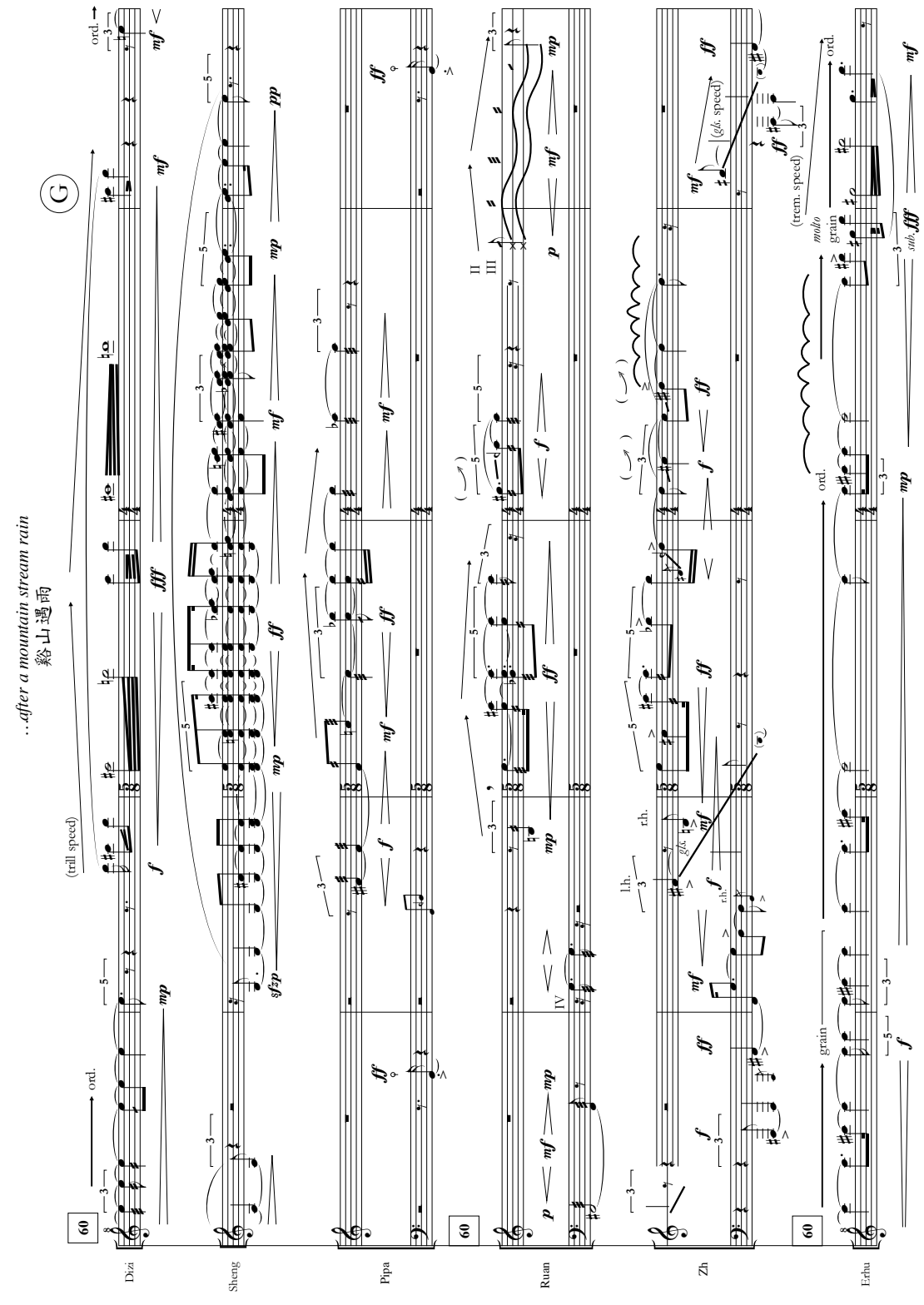
…after a mountain stream rain

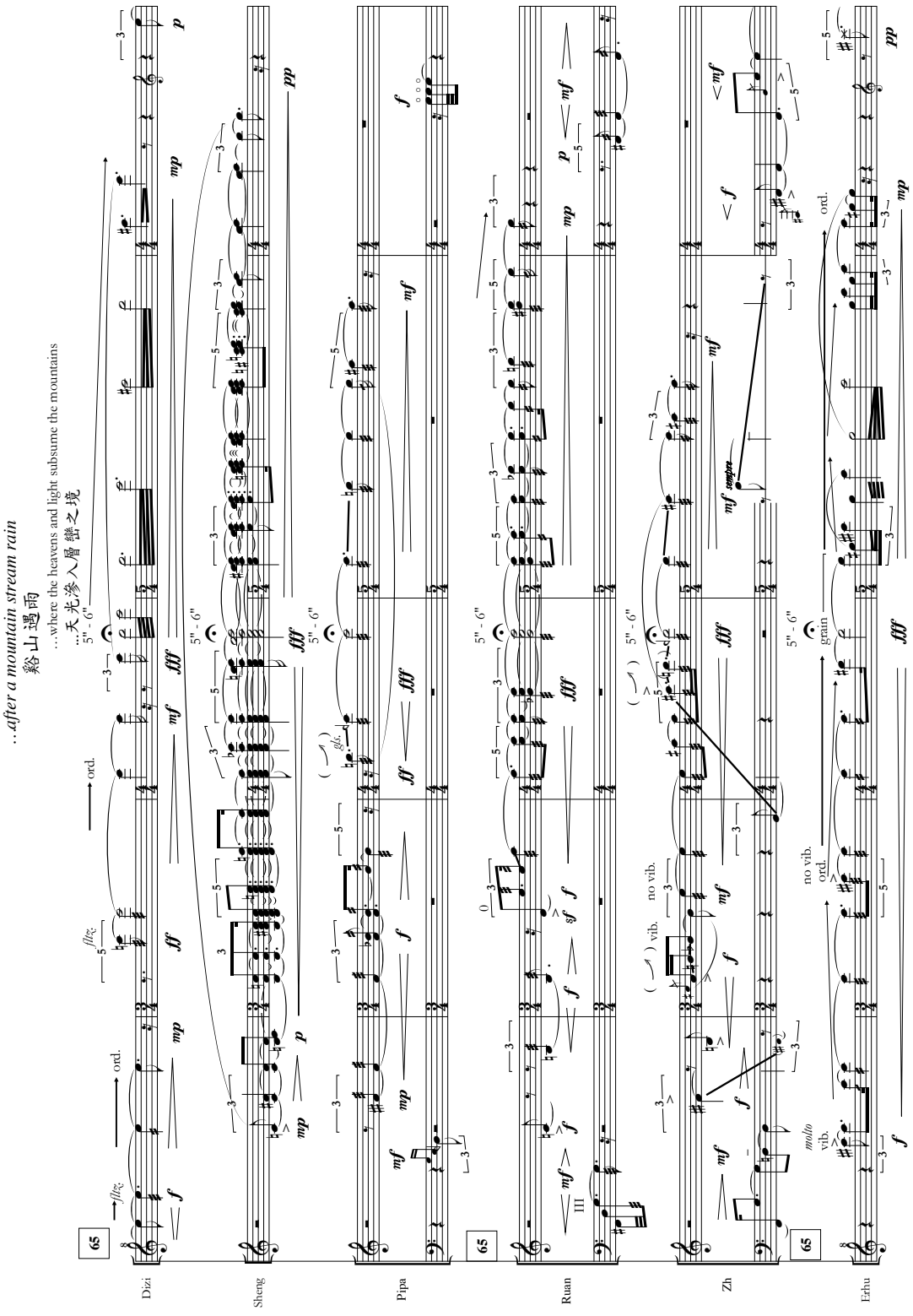
谿山遇雨

F II. A clearing in the forest – rising mountains, penetrating light, drifting heavens…

二、撥雲出森 - 昇岳、透光、浮穹...

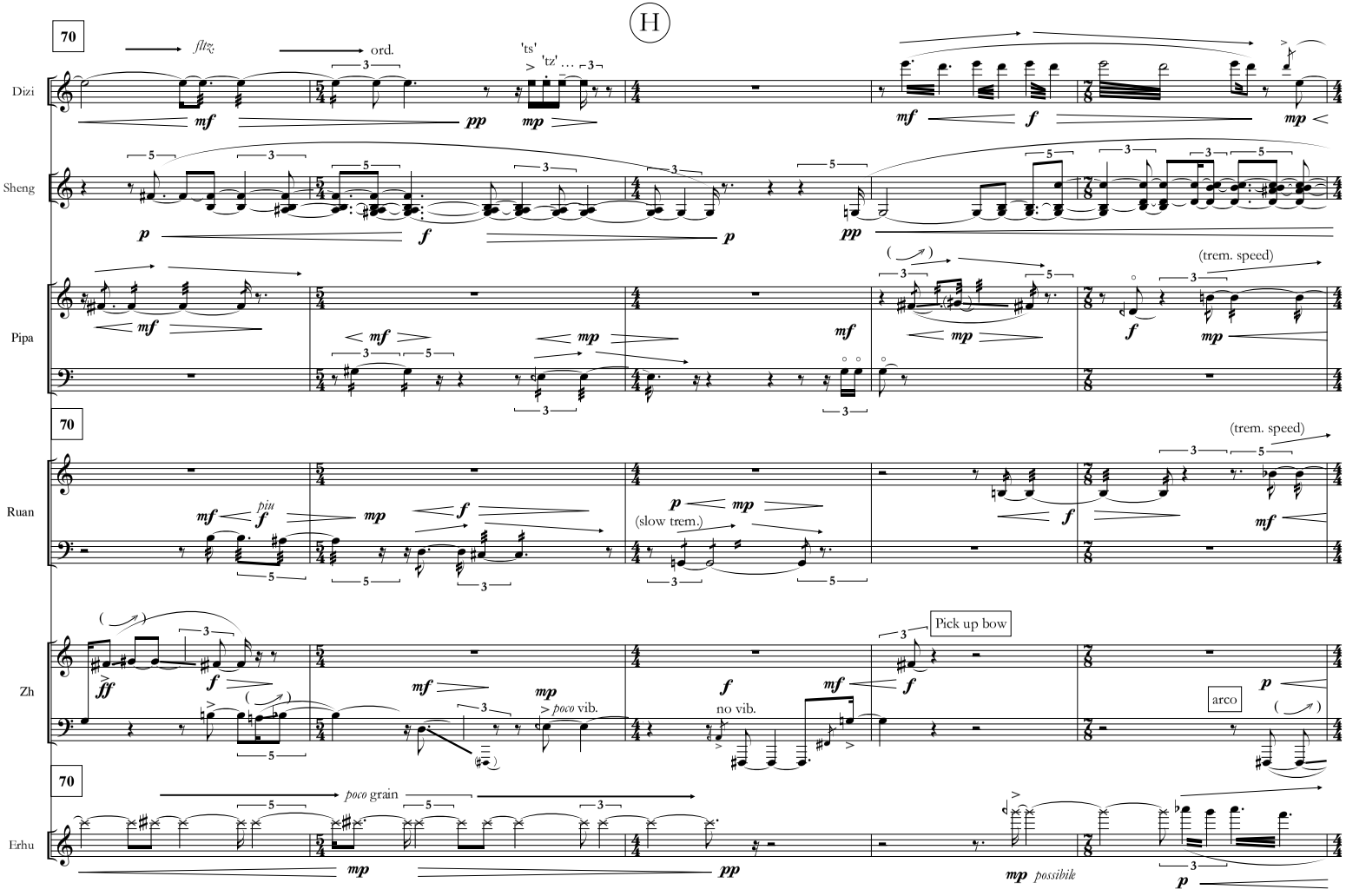


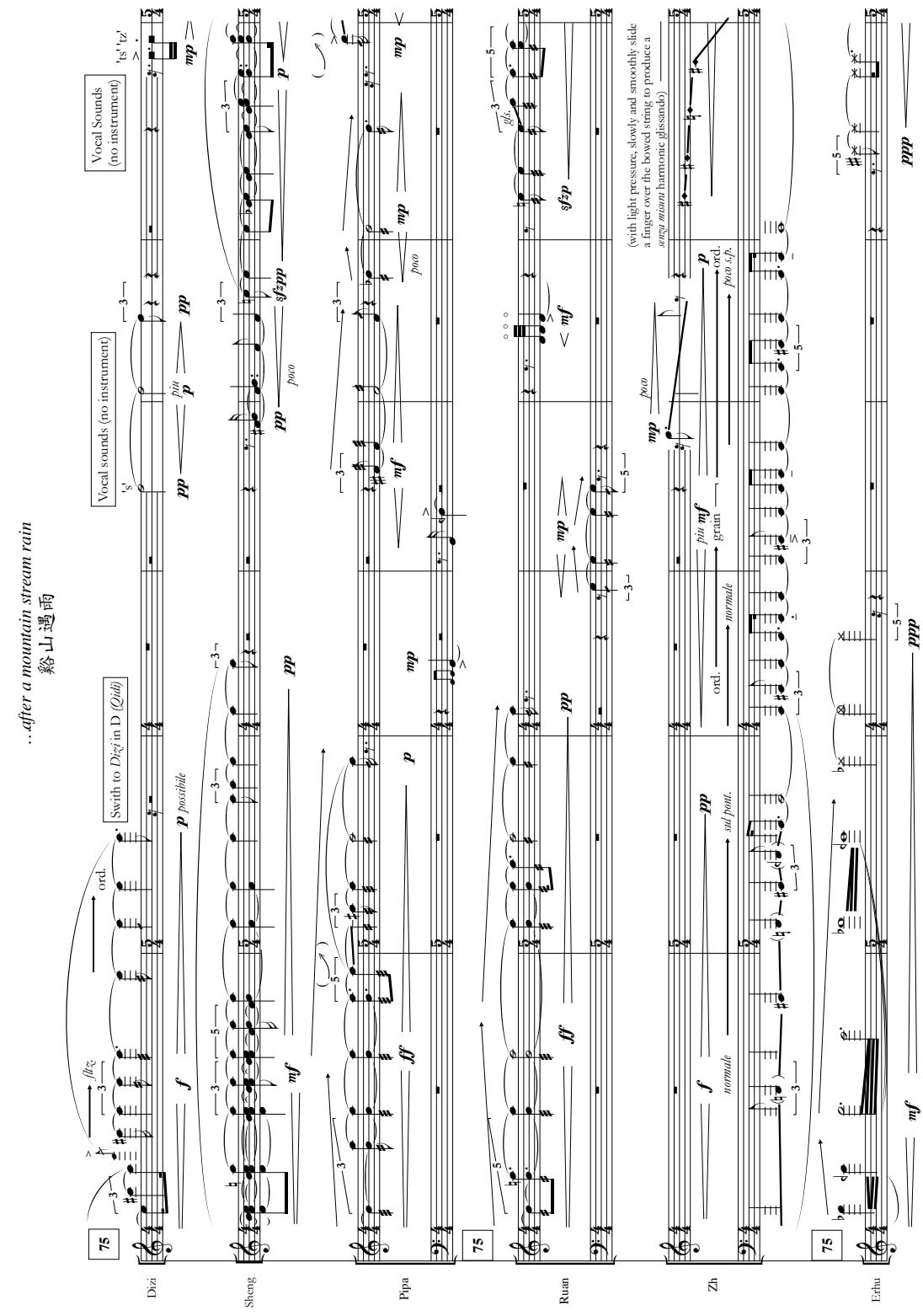

...after a mountain stream rain
谿山遇雨
G
60
Dízí
Sheng
Pipa
Ruan
Zh
Erhu
(trill speed)
ord.
grain
molto
(trem. speed)
l.h.
r.h.


...after a mountain stream rain
谿山遇雨
...where the heavens and light subsume the mountains
...天光滲入層巒之境
65
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
ord.
5" - 6"
no vib.
molto vib.
grain

..after a mountain stream rain

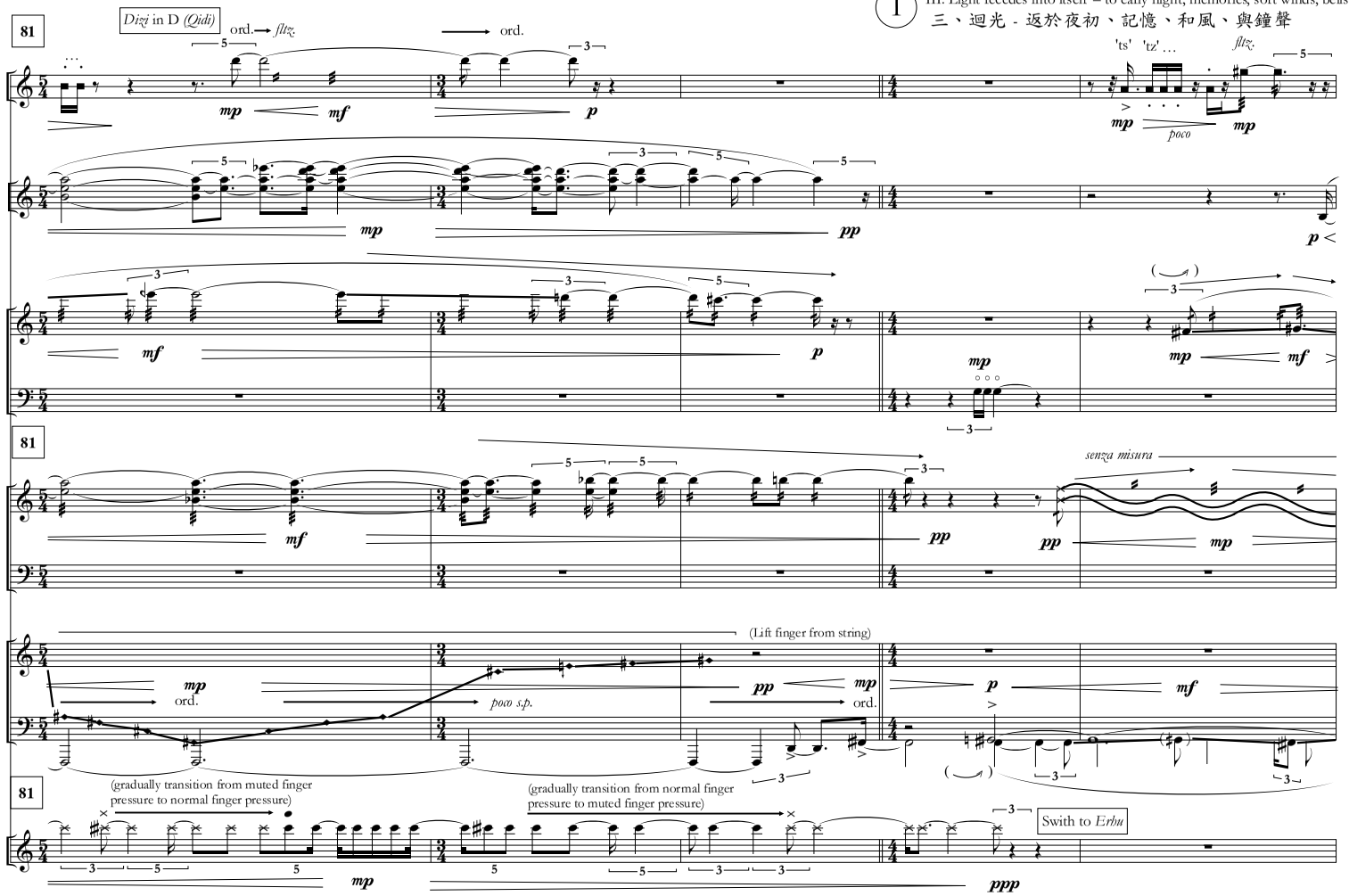
谿山遇雨

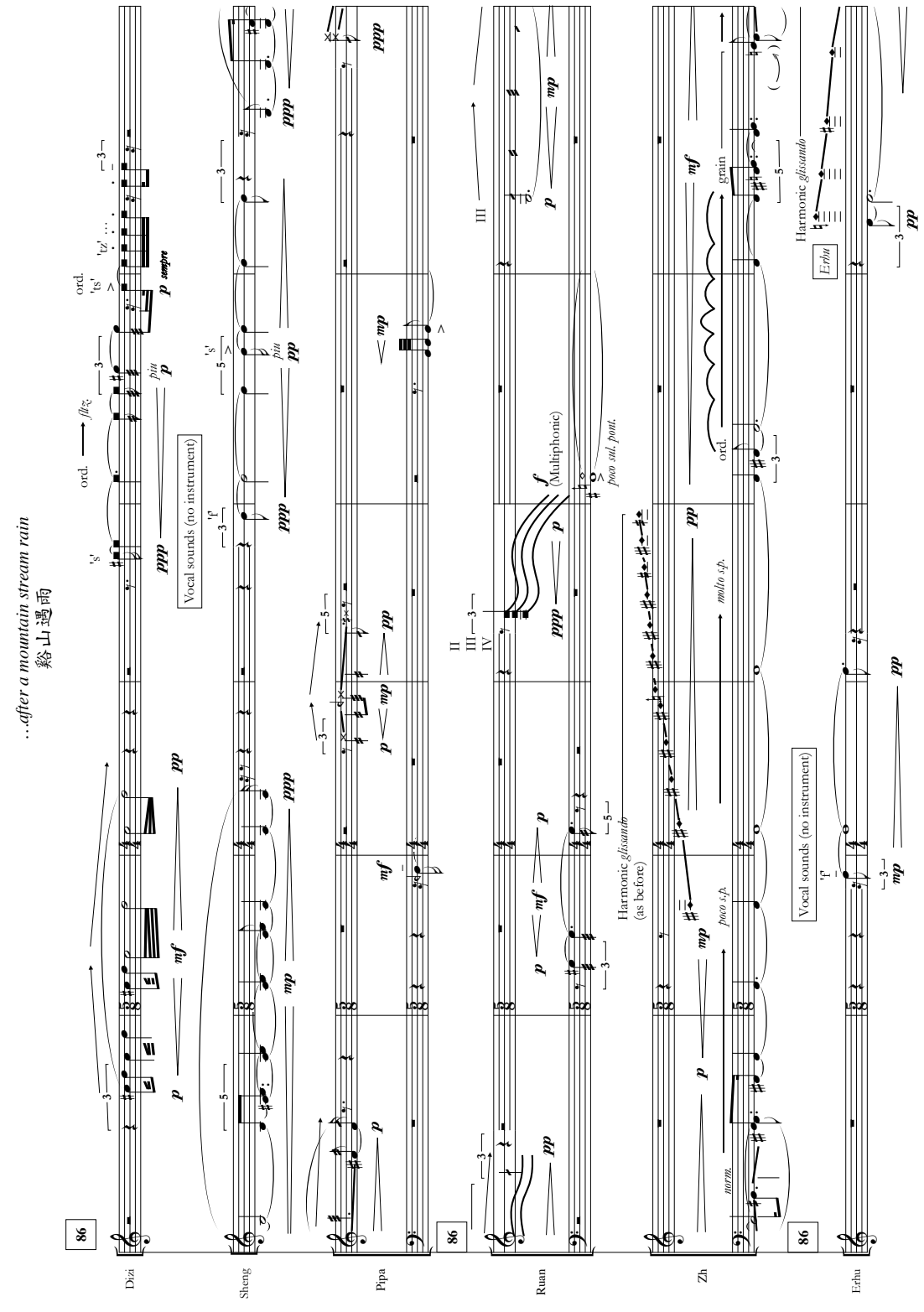


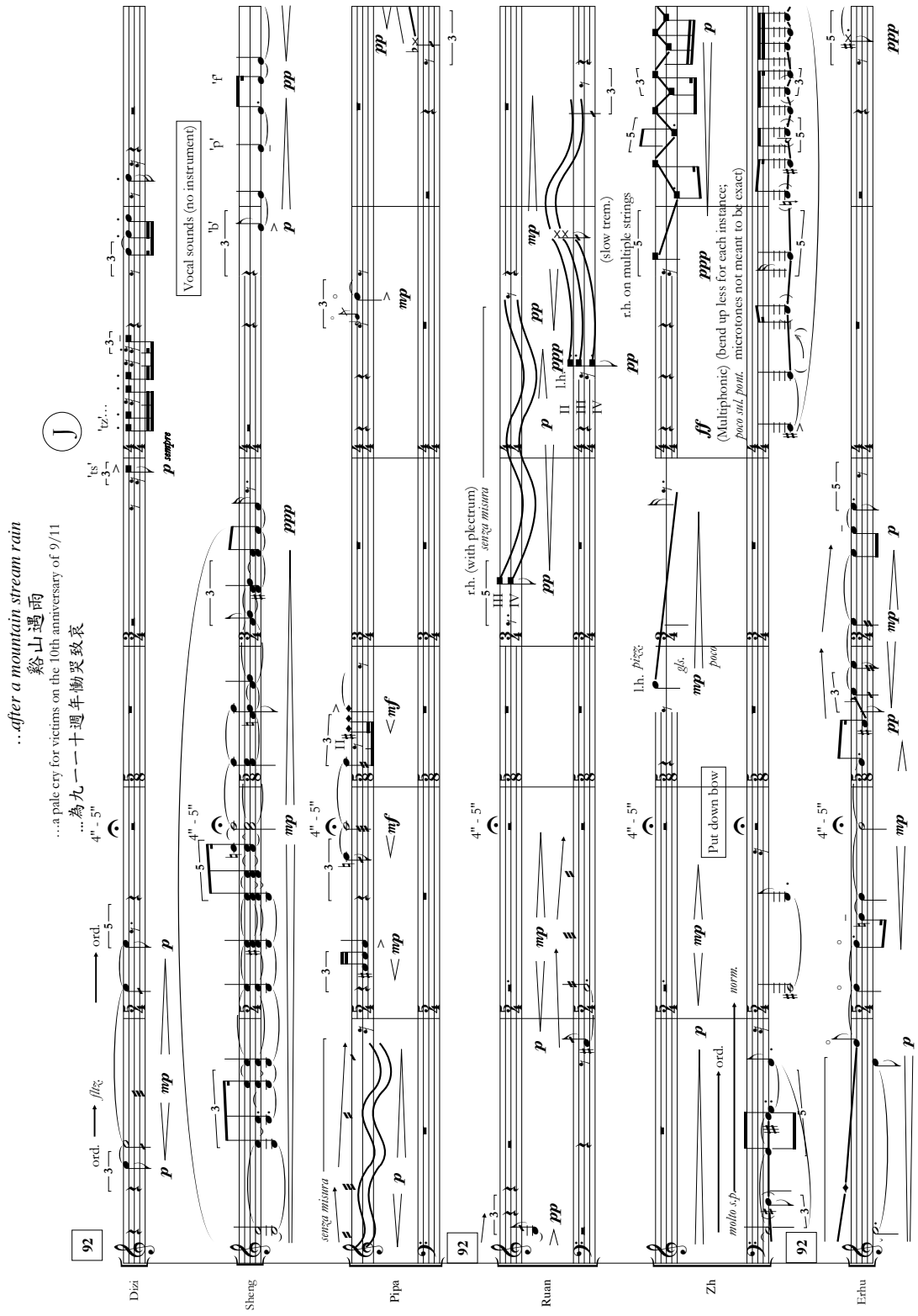

...after a mountain stream rain
谿山遇雨
Vocal Sounds (no instrument)
Vocal sounds (no instrument)
Swith to Dizi in D (Qudi)
(with light pressure, slowly and smoothly slide a finger over the bowed string to produce a serega misura harmonic glissando)
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
75

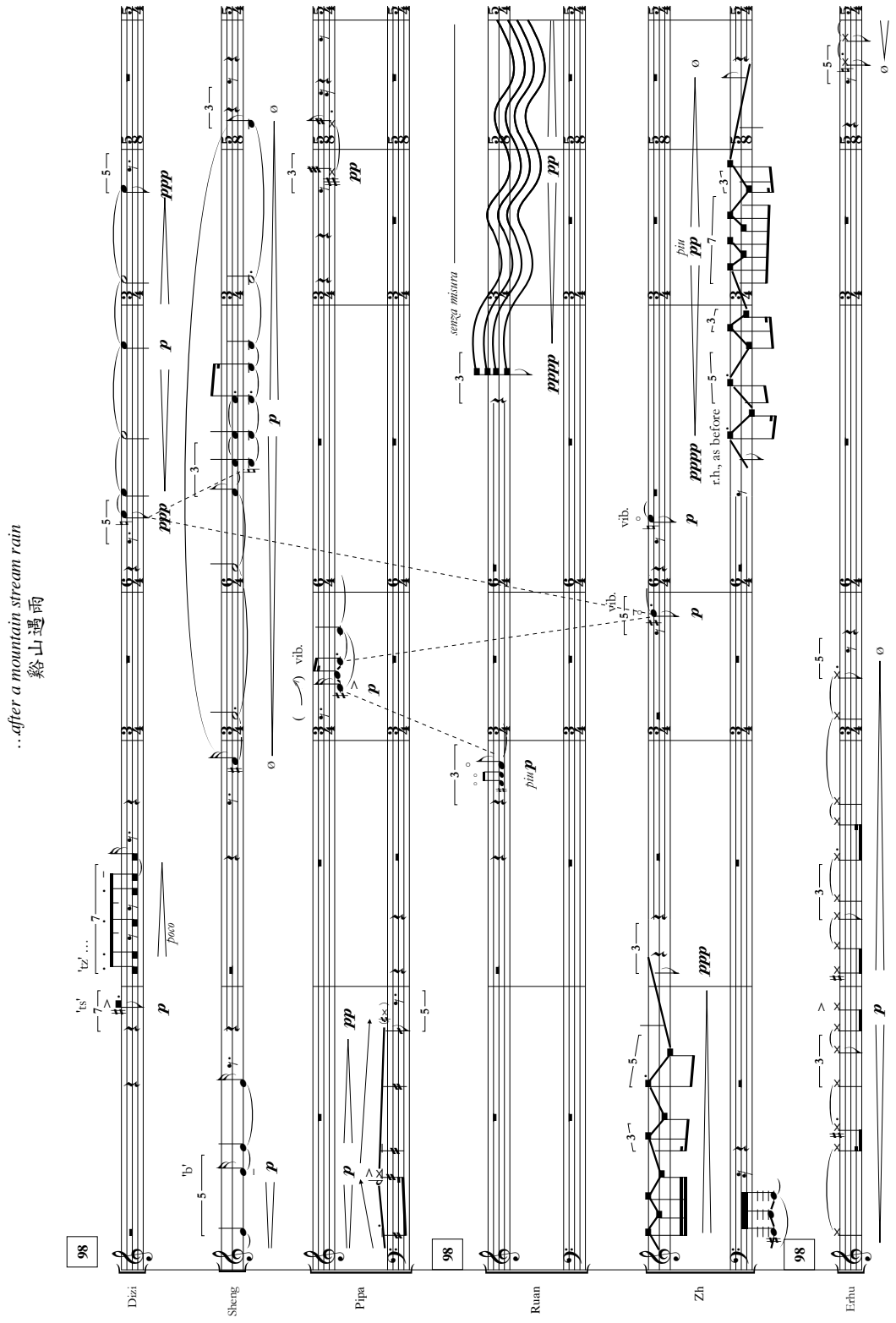
..after a mountain stream rain
谿山遇雨

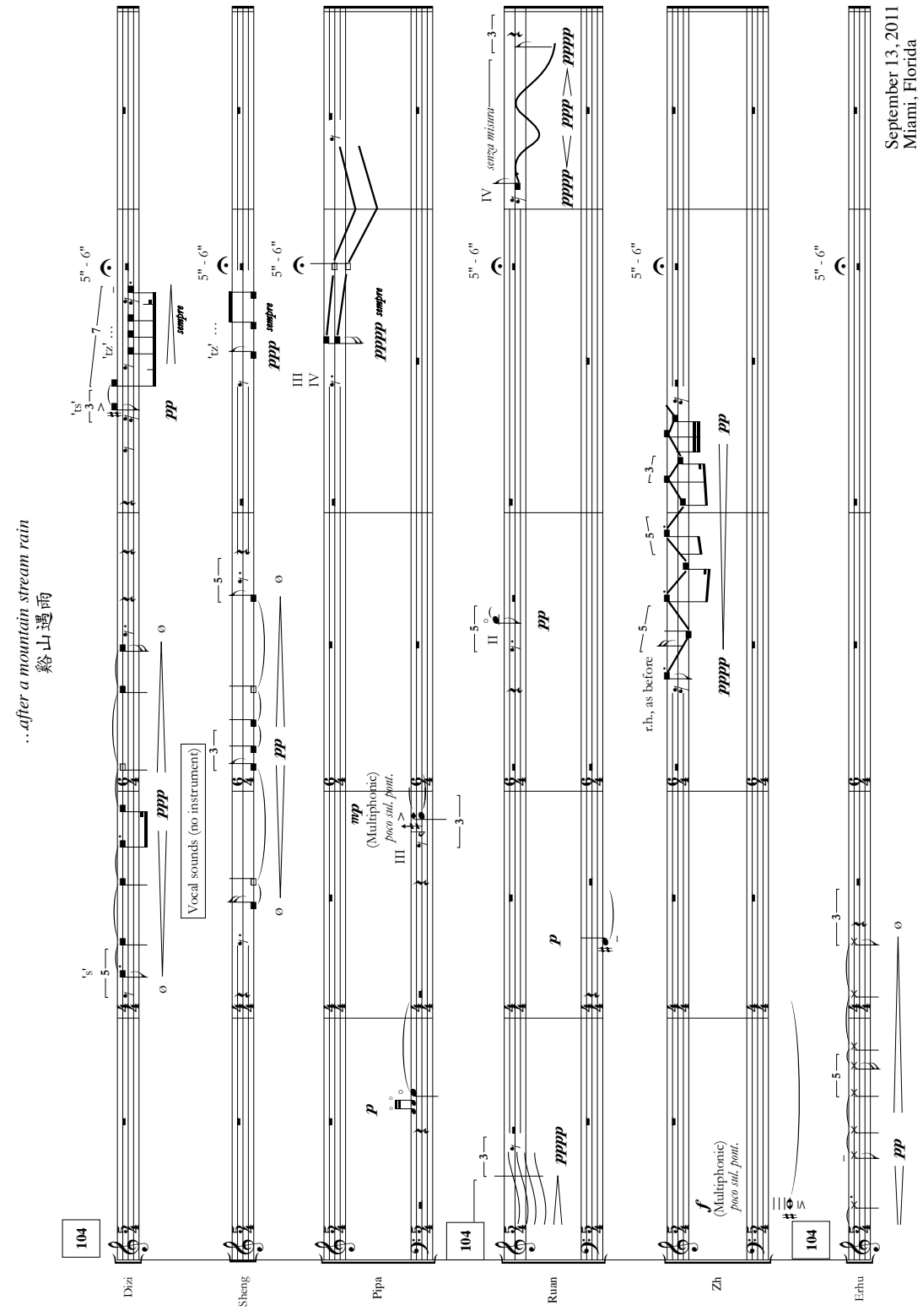
I III. Light recedes into itself – to early night, memories, soft winds, bells
三、迴光 - 返於夜初、記憶、和風、與鐘聲




...after a mountain stream rain
谿山遇雨
Dízí
Sheng
Pipa
Ruan
Zh
Erhu
86
Vocal sounds (no instrument)
Harmonic glissando
(as before)
(Multiphonic)
poco sul. pont.
poco s.p.
molto s.p.
grain
ord.
norm.
Erhu


...after a mountain stream rain
谿山遇雨
...a pale cry for victims on the 10th anniversary of 9/11
...為九一一十週年慟哭致哀
J
Vocal sounds (no instrument)
Put down bow
(Multiphonic) (bend up less for each instance; microtones not meant to be exact)
(slow trem.)
r.h. on multiple strings
r.h. (with plectrum)
senza misura
Dizi
Sheng
Pipa
Ruan
Zh
Erhu


...after a mountain stream rain
谿山過雨
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
98
poco
vib.
senza misura
più
r.h., as before


...after a mountain stream rain
谿山遇雨
September 13, 2011
Miami, Florida
Dizi
Sheng
Pipa
Ruan
Zh
Erhu
104
Vocal sounds (no instrument)
5" - 6"
(Multiphonic)
poco sul. pont.
r.h., as before
venzza misura

EXTENDED PROGRAM NOTE FOR *ACROSS AN OCEAN, ACROSS THE LAND…*

across an ocean, across the land… for laptop ensemble was composed in the fall and winter of 2011 for the Florida International University Laptop and Electronic Arts (FLEA) Ensemble that I direct. The composition uses a collection of 30 short recordings of a big Tibetan singing bowl, a small Tibetan singing bowl, one pair of *tingsha* (Tibetan prayer cymbals), and the giant *Mikrophonie* tam-tam as well as multiple simple transformations of these sounds to generate a large variety of consistently non-gestural material.

The composition is based on slow changes in the properties of many different instantiations of one mildly complex stochastic algorithmic process that selects the transpositions, dynamics, and rhythms of the samples' playback. Three other surface algorithmic processes effect how the sounds are virtually positioned in the surround sound quadraphonic speaker setup. The general principle that guides the timing of each of these changes is that the changes should be almost so slow that they can only be noticed after they have happened. The goal of this approach is to explore and potentially define a region where the meanings of a teleological and static perception of time and form are obscured. Aesthetically, I also view this approach as a means to create a new sort of ritualistic listening where both serendipity and each individual listener create unique personal engagements with the music and the material.

The results of the stochastic algorithm in *across an ocean, across the land…* are determined by the interaction of a collection both deterministic and probabilistic variables. During the performance, the laptop performers use a performance patch to alter some or all of these variables to create the resulting sonic texture.

I have developed similar algorithmic techniques in multiple compositions for instruments and live electronics since "*…wash yourself of yourself"* (2009-2010). However, unlike these previous which use either a live instrument or samples from a pitched instrument, the live electronics in *across an ocean, across the land…* makes extensive use of pre-recorded inharmonic sounds as well as some more extended recordings of textural material.

The composition is diffused through a four-speaker/quadraphonic set up that surrounds the audience. Four laptop performers control the electronic sounds through a Max/MSP patch that I created explicitly for this composition. A graphic score outlines the general progression of the composition; however, as has been the case with most of my more freely structured compositions since *until we remain suspended*…, the duration and general progression of the structure are slightly flexible and scalable.

The recording is a mock-up of an ensemble performance where I played all the parts.

The title and form of the work, like virtual wind chimes, reflect on the challenges and emotions I faced spending most of the summer, fall, and winter across the Pacific Ocean and/or the United States from my wife.

across an ocean, across the land…

For Laptop Ensemble (Four Players)

-Jacob David Sudol

across an ocean, across the land…

For Laptop Ensemble (Four Players)

Technical/Equipment Requirements:

• Four computers with at least 2 GB RAM, a 2.5 dual-core Intel processer or faster, Max/MSP version 5 or greater, the necessary drivers, and the Performance Patch programmed by the composer

• Four Digital Audio Interfaces which each have four or more outputs

• Mixer with a minimum of 16 mono channels in and four channels out

• Quadraphonic loudspeaker set-up

Duration:

Approximately 23 to 24 minutes

Program Note:

across an ocean, across the land… was composed in the fall and winter of 2011 for the Florida International University Laptop and Electronic Arts (FLEA) Ensemble. The composition uses a collection of 30 short recordings from two Tibetan singing bowls, one pair of *tingsha* (Tibetan prayer cymbals), and the giant *Mikrophonie* tam-tam to progressively build and take apart a texture filled with over a thousand different sounds per minute. The title and form of the work, like virtual wind chimes, reflect on the challenges and emotions I faced spending most of the summer, fall, and winter across the Pacific Ocean and/or the United States from my wife.

Jacob David Sudol

January 20, 2012

San Diego, CA

Electronics' and Software Documentation:

across an ocean, across the land… was composed in the fall and early winter of 2011 for the Florida International University Laptop and Electronic Arts (FLEA) Ensemble. I premiered an initial solo version of the work at the 2011 Miami Art Basel in front of the Harold Golen Gallery in the Wynwood Arts District in December 2011. A second pre-recorded version was presented at the Gibson Gallery in Miami, Florida in early January 2012.

across an ocean, across the land… makes extensive use of a number of stochastic algorithmic techniques that I have developed in multiple compositions for instruments and live electronics since "*…wash yourself of yourself"*. However, unlike these previous which use either a live instrument or samples from a pitched instrument, the live electronics in *across an ocean, across the land…* makes extensive use of pre-recorded inharmonic sounds as well as some more extended recordings of textural material.

The composition is diffused through a four-speaker/quadraphonic set up that surrounds the audience. Four laptop performers control the electronic sounds through a Max/MSP patch that I composed explicitly for this composition. A graphic score outlines the general progression of the composition; however, as has been the case with most of my more freely structured compositions since *until we remain suspended…*, the duration and general progression of the structure are slightly flexible and scalable.

Technical Requirements and Set Up

Mixer:

A mixer with a minimum of sixteen mono input channels and four output channels is required to perform *across an ocean, across the land…* All channels should have individual volume controls and be set so that all input and output channels have the same amplitude.

Digital Audio Interface:

Each laptop should have a digital audio interface that can output four channels as well as handle a sampling rate of 96 kHz and 24-bit audio. A MOTU UltraLite-mk3 Hybrid, a digidesign 003 and a MOTU 896 have been used successfully in both rehearsal and performance.

Speakers:

Four balanced speakers, and an optional subwoofer, are required for performance. All speakers must have a wide dynamic range and well-balanced frequency response from 20 Hz to 48 kHz. If one cannot use speakers that do not effectively produce loud low frequencies, one must also use one or two subwoofers and route the lower frequencies to these.

The speakers should be placed around the audience and near the four corners of the performance space. Each speaker should also be placed at an approximate equal distance from a position in the center of the performance space (Figure 1).

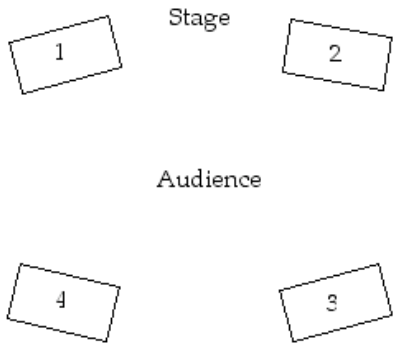


Figure 1: Four balanced speakers set up around the audience

Computer, Software, and Software Installation:

Each laptop performers needs a high-end Apple computer with Mac OS 10.5.8 or higher, at least 2 GB of RAM, a 2.13 GHz Intel Core 2 Duo or higher, Max/MSP 5.1.9 or higher, the performance patch and files, and the appropriate digital audio interface drivers are required for performance. (The current version of the software does not work on the Windows operating system or current versions of Max/MSP 6.) As the software requires a lot of processing power, it is preferable to use the most powerful computer available. In particular, the software works best on computers that have four or more processors. For performance and rehearsal, each performer operates an identical version of the software on his or her computer.

To install the software on a computer, copy the folder “Distances” to the computer’s hard drive. After copying the files open Max/MSP and go to “File Preferences” under the “Options” menu. From there add the entire folder “Distances” as a path. After this, quit Max/MSP and open the performance patch titled “Across(PerformancePatch).maxpat”.

Signal Routing:

Each computer outputs four distinct audio channels, numbered 1 to 4, from a digital audio interface. These audio channels are routed through the mixer to the corresponding speaker. Each performer’s output should be set to an identical level within the mixer.

Performance Instructions

General:

A collection of stochastic algorithms generate the music in *across an ocean, across the land…* During performance, rather than directly controlling what sounds, the laptop performers control the parameters of these algorithms following clearly defined progressions. As a result of this approach, no rehearsal or performance of *across an ocean, across the land…* will ever be the same. This compositional approach intends to more accurately represent and respect the algorithmic models than would be possible by any transcription. Furthermore, this approach shines a light on

how both individuals and a group respond to and interact with the results and behaviors of a process that they do not have complete control of.

Sonic Materials:

across an ocean, across the land… uses a collection of short recordings of a big Tibetan singing bowl, a small Tibetan singing bowl, one pair of *tingsha* (Tibetan prayer cymbals), and the giant *Mikrophonie* tam-tam. Image 2 has a picture of the Tibetan bells used for the recordings and Image 3 has a picture of the tam-tam.

Image 2: The three Tibetan bells

Image 3: The *Mikrophonie* tam-tam

The performance patch makes use of three different mono recordings of the big Tibetan singing bowl and one mono recording of both the small Tibetan singing bowl and the *tingsha*. To make these samples, I recorded my own playing of the Tibetan bells in the recording studio at the Conrad Prebys Music Building at the University of California, San Diego in Spring 2011.

The patch makes use of 25 stereo recordings of the giant *Mikrophonic* tam-tam. These recordings are divided into five different categories. The first category, labeled "Tam Attacks" in the patch, contains seven different recordings ranging in length from 15 seconds to 22 seconds of a dead-stroke played on the center of the tam-tam. These seven audio files are split into to two sub-categories consisting of four louder recordings and three quieter recordings. The second category, labeled "Rubbing Tam,"

contains five different recordings ranging in length from eight seconds to 58 seconds of one or two bare hands rubbing the surface of the tam-tam. These files are split into two sub-categories consisting of three shorter recordings and two longer recordings. The third category, labeled "Grinding Tam," consists of five different recordings ranging in length from 20 seconds to 63 seconds of one or two wire metal brushes grinding against the surface of the tam-tam. These files are split into two sub-categories consisting of three shorter recordings and two longer recordings. The fourth category, labeled "Scraped Tam," consists of five different recordings ranging in length from 19 to 27 seconds of a metal bar being scraped along the edge of the tam-tam. The last category, labeled "Other Tam Sounds," contains three audio files ranging in length from twelve seconds to 49 seconds of the tam-tam being activated by various methods of transduction. All of the tam-tam sounds were played by percussionist Steve Solook and recorded by the composer in the recording studio at the Conrad Prebys Music Building at the University of California, San Diego in Fall 2011

The performance patch for *across an ocean, across the land…* slows down, speeds up, or doesn't change the playback spead all of these audio files to transpose the samples. These possible transpositions are primarily based upon four harmonic fields outlined below and synthetic symmetrical scales where a specific number of cents ($1/100^{th}$ a half-step) separates each note from each successive higher or lower note.

The four harmonic fields come from spectral analyses of the same Tibetan bell recordings mentioned directly above. In these harmonic fields, the notes correspond to the strongest partials in the harmonic analyses. In all of the harmonic fields, the

pitches are numbered from lowest to highest. In the following figures, bigger "*"s are placed above specific notes that correspond to the loudest partials so that the bigger the "*" the louder the partial. Also for clarity, in the following figures and the graphic score, the notes have been approximated to the nearest quarter-tone (50 cents). In the performance patch, these partials are rounded to the nearest cent.

The first harmonic field comes from a spectral analysis of the *tingsha* (Figure 2).

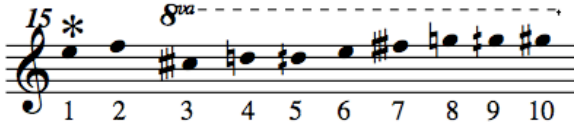


Figure 2: The *tingsha* harmonic field

The second harmonic field comes from a spectral analysis of the small Tibetan singing bowl (Figure 3).

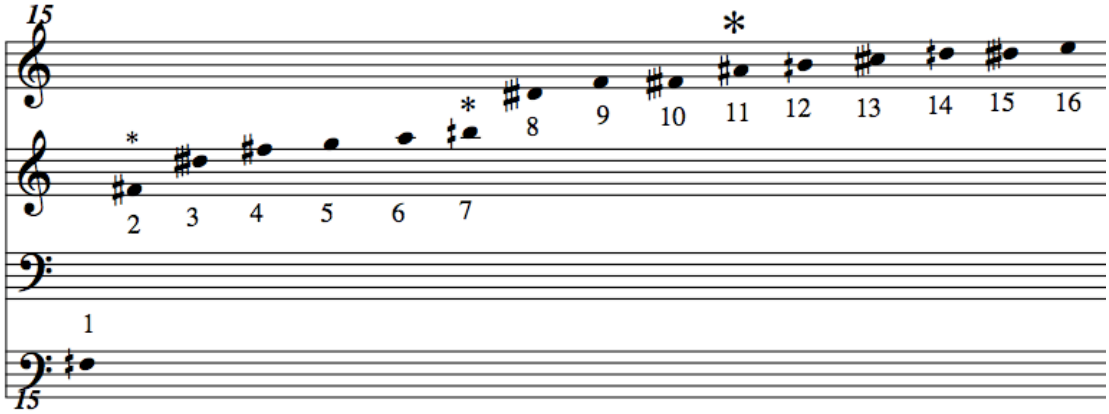


Figure 3: The small Tibetan singing bowl harmonic field

The third harmonic field comes from the spectral analysis of the big Tibetan singing bowl (Figure 4).

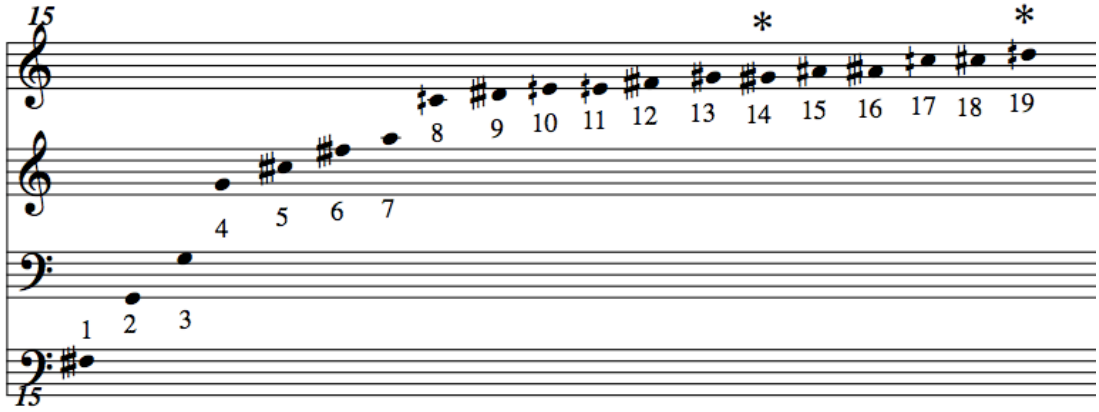


Figure 4: The big Tibetan singing bowl harmonic field

The fourth harmonic field comes a combination of the three previous harmonic fields (Figure 5). This last harmonic field is the primary used one in *across an ocean, across the land….*

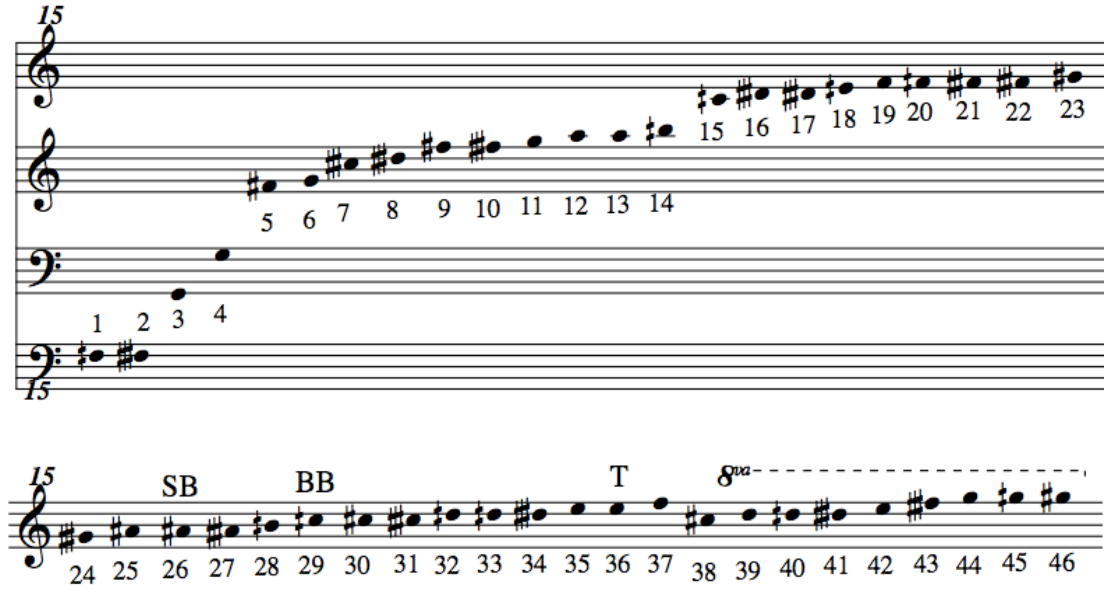


Figure 5: The "All Bells" harmonic field

When transposing the recordings of the three Tibetan bells the performance patch treats the loudest partial as if it were the fundamental pitch of the bell so that, for example, if the *tingsha* recording is to play the 11th note of the small Tibetan singing bowl harmonic field the patch will slow down the *tingsha* recording so that it sounds approximately a tritone lower than the original recording. When transposing the recordings of the tam-tam, the performance patch treats the tam-tam's fundamental as though it were the E four octaves above middle C.

For the playback of the Tibetan bell recordings, the performance patch allows the laptop performer to introduce a random variation of cents above and below the chosen note. This is done to imitate the observed slight variations in the samples' partials.

Formal Attributes and Algorithmic Processes:

across an ocean, across the land… is based on slow changes in the properties of many different instantiations of one mildly complex stochastic algorithmic process that selects the pitches, dynamics, and rhythms of the samples' playback. Three other surface algorithmic processes effect how the sounds are virtually positioned in the surround sound quadraphonic speaker setup. The general principle that guides the timing of each of these changes is that the changes should be almost so slow that they can only be noticed after they have happened. The goal of this approach is to explore a region where the meanings of a teleological and static perception of time and form are

obscured. Aesthetically, I also view this approach also as a means to create a new sort of ritualistic listening where both serendipity and each individual listener create unique personal engagements with the music and the material.

The results of the primary algorithm in *across an ocean, across the land…* are determined by the interaction of a collection both deterministic and probabilistic variables. During the performance, the laptop performers use the performance patch to alter some or all of these variables to create the resulting sonic texture. These variables are listed in Table 1 below.

Table 1: List of the Variable Names and Accompanying Definitions for the Primary Algorithm in *across an ocean, across the land…*

Variable Name:	Variable Definition:
Tempo	Rate in samples (or melodic phrase for the "Melody" algorithm described below) per second or millisecond.
Tempo Jitter	Jitter (i.e. random variation) of the Tempo variable. Defined as a decimal-ratio of the duration that the Tempo variable specifies.
File Duration	How many milliseconds of the audio file will be played. If a value of 0 is selected, the audio will play for its full duration whether its playback speed has been increased, decreased, or unchanged.
Swell in	A duration in milliseconds that the file will swell from an amplitude of 0 to its otherwise specified amplitude.
Amplitude	The specific dynamic that the samples have. Dynamics range from 0 to 127 where 0 is silent and 127 is the original amplitude of the file.

Table 1: List of the Variable Names and Accompanying Definitions for the Primary Algorithm in *across an ocean, across the land…*, continued

Amplitude Jitter	Jitter of the dynamics down from the value specified by the Amplitude variable. Defined as a decimal-ratio of the amplitude that the Amplitude variable specifies.
Interrupt Probability	Probability that a sample's instantiation will be replaced with a rest.
Interrupt Maximum	The maximum number of possible consecutive instantiations of a sample being replaced with a rest.
Harmonic Field	Which harmonic field the samples will be transposed unto.
Range High	A number corresponding to the highest partial from the specified harmonic field.
Range Low	A number corresponding to the lowest partial from the specified harmonic field.
Pitch Jitter	A maximum value in cents from which the sample will be random transposed up or down from the partial that the patch picks.
Sample Played	Which sample sounds when the algorithm determines a note. The options are either any of the Big Bowl samples chosen at random, the Small Bowl samples, the *Tingsha* sample, either the Big Bowl or Small Bowl samples (with an equal probability that either bowl will sound), or all the bells (with an equal probability that either bowl or the *Tingsha* will sound)
Descending Probability	Probability that the samples will descend one number partial lower than the previous from within the range specified above. If the previous partial is the lowest partial of the specified range, the highest partial of the range will sound. Pitch choice is entirely random otherwise.

In the first voice in each laptop performer's performance patch there is a function that allows the user to set a time and begin a transition between a harmonic field and a synthetic scale comprised of 66-cent steps. For this transition, the field or scale that the samples are transposed onto is determined by a probability so that, for example in a transition between the harmonic field and scale, at the beginning there is a 100% probability that the harmonic field will be chosen, at the half-way point there is an equal possibility that the scale and field will be chosen, and at then end there is 100% probability that the scale will be chosen. Each performer triggers a transition first to the synthetic scale and then, after a certain amount of time, back to the harmonic field only once during a performance in *across an ocean, across the land…*

In addition to the variables defined above, in most layers a laptop performer can choose to play a sample by simply pressing a button in the patch. When the performer does this all other parameters besides the speed determine the sample, interrupt probability, transposition, and dynamic. This manual sample starting has no effect on how the algorithm otherwise runs.

A separate layer, labeled Melody in the performance patch and score, operates similarly to the algorithm specified above. The differences are that it uses the synthetic symmetrical scales described above, it has a 100% Descending Probability, and the algorithm runs for a specified time to create a sort of melodic phrase instead of just the playback of a single samples. Three additional variables unique to the Melody layer control these differences (Table 2).

Table 2: The Three Additional Unique Variables for the Melody Algorithm

Variable Name:	Variable Definition:
Range Scale	The interval, in cents, between each successive note of the synthetic scales. The performer specifies a specific value or a range that the computer will choose the fixed cent value from.
Melody Range	The duration, in milliseconds, between the first and last note of the melodic phrase.
Melodic Offset	Amount of transposed cents down that the melodic phrase starts at. By default, the first note in the phrase has no transposition.

The performance patch in *across an ocean, across the land…* uses the four speakers to define a virtual circle and the VBAP software[1] to define where each sound is independently positioned. In this virtual space, angle and distance define the exact position. Figure 6 shows how VBAP defines the angles in this virtual circle.

[1] VBAP stands for Vector-Based Amplitude Panning. The performance patch uses an external library for Max/MSP. (Pulkki, Ville. "Compensating Displacement of Amplitude-Panned Virtual Sources." *Audio Engineering Society 22th International Conference on Virtual, Synthetic, And Entertainment Audio*. Espoo, Finland: N.p., 2002. 186-195.)

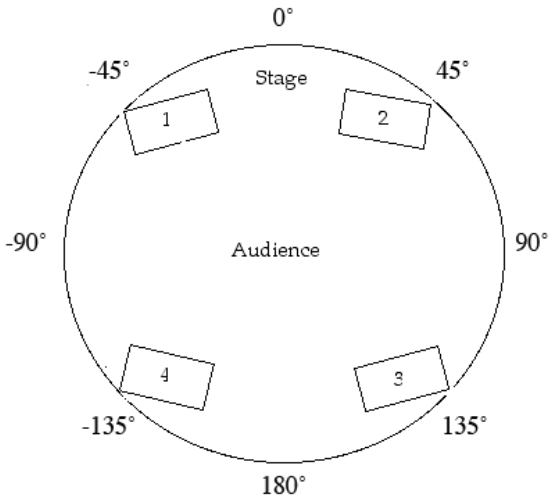


Figure 6: How VBAP defines angular position in *across an ocean, across the land…*

Distance is defined within a range of integers from 0 to 100. VBAP defines a distance value of 100 as the maximum distance and therefore positions the sound on the periphery of the virtual circle. A distance value of 0 is the minimum distance and implies that the sound is at the center of the virtual circle and will sound with the same amplitude from all speakers.

The performance patch for *across an ocean, across the land…* positions each Tibetan bell sample in a different fixed position for the duration that the sample plays. These positions are determined following an algorithm similar to the first one described above that determines note choice. Specifically, a probability determines whether the angular position of each sample either tends to move clockwise, counter-clockwise, or alternating between clockwise and clockwise around the virtual circle of sound or from a random position. In some instances the performer can determine the probability that whether successive sounds will move clockwise, counter-clockwise, or

alternating between clockwise and counter-clockwise or random. In addition, the performer can determine whether the random position either tends to come from the front of the performance space (defined as "Front Gaussian" in the performance patch) or from any possible angle (defined as "Totally Random") in the performance space. Concerning this latter variable, performers should choose "Front Gaussian" when the performance occurs in a location where the audience is all facing forward and "Totally Random" when the performance space does not prioritize any specific listening direction. In this algorithm, the performance patch uses drunk motion to choose successive distance positions between 100 and 60. During performance, the Voice layers 1 and 2 should move clockwise and Voices layers 2 and 4 should move counter-clockwise, both with a probability of movement between 35% and 75%.

The performance patch treats the tam-tam recordings as virtual stereo files with a continuous angular distance between their "left" and "right" channels. Each time a tam-tam file starts the patch randomly selects a virtual stereo width between 60˚ and 120˚ for the specific instantiation of the audio file's playback. In contrast to the Tibetan bell recordings, the tam-tam recordings continuously move across the virtual circle that encloses the listening space. A randomly selected series of values that have Fibonacci relationships with each other define the movement speeds and the angular destinations.

Structure, Software Operation, and Notation:

The sonic materials and algorithmic processes outlined above work together to create a collection of different musical layers. As the composition progresses these different layers diverge and converge as well as subsume each other and break apart. The performance patch for *across an ocean, across the land…* allows the laptop performers to control how these different layers act and change over time. The following section explains how the performers control these layers in the patch and how these controls are notated in the composition's graphic score.

Of note, the score does not define which performers should control which layer. Before performance, the performers need to determine which performer will control which layer. This approach gives the performers greater flexibility to determine how many different layers one can manage at a time. In addition, it allows the performers with more powerful computers to handle the more computational intense layers such as the Melody layers. To facilitate making parts for each musician, one can request the part scores for each layer that the performers can cut up to make their own complete performing parts.

In practice, three performers have successfully rehearsed the piece. However, for this, one performer would sometimes double the speed of a process to make it sound as if one layer is two sounding simultaneously layers. With this in mind, the piece is mostly easily and fairly balanced when performed by four players. This said, the work can be played by as many as five or six performers. NB in the case of a

performance by more than four players, the mixer must have an additional four inputs for every performer beyond four players.

The score provides descriptions of how the performers initialize and change the parameters for the various layers. The score also provides specific details for parameters for items such as the file played, the high and low range, and the harmonic field. For other parameters, the score provides general descriptions, such as more standard musical notations like ***fff*** and ***ppp*** for dynamics, for how to control the voice layers. (More details on these less specific notational symbols are provided below.) In these latter less specific cases, each performer needs to listen carefully to the composite sound and constantly experiment and adjust to determine the specific values that he or she will use for the algorithm's parameters.

After opening the performance patch, pressing the number "1" on the keyboard in the main window will open the sub-patch where one controls the first layer or "Voice 1". Figure 7 shows a screen shot of this sub-patch.

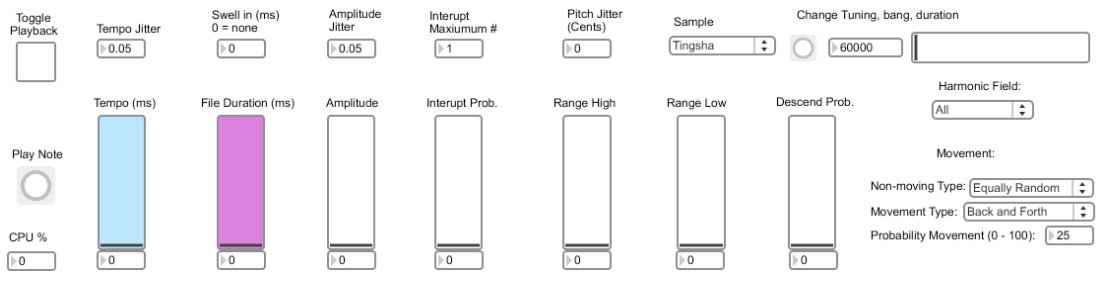


Figure 7: The sub-patch window that the performer uses to control "Voice 1"

The controls in this window correspond to the parameters outlined in Table 1 and the description of the Tibetan bells spatialization algorithms directly above. Before operating "Voice 1" the performer should select values on all of the sliders, number boxes, and menus that correspond to the values specified in the graphic score. To begin "Voice 1" the performer clicks the toggle under the text "Toggle Playback." During performance, "Voice 1" is the first layer that each performer begins with.

The button, number box, and slider under the text "Change tuning, bang, duration" controls the transition between the harmonic series and synthetic 66-cent scale described above. At the time indicated in the score the performers click on this button to start the transition from the harmonic series to the synthetic scale. The slider to the top right of the window indicates the state of this transition so that when the bar is on the left side there is a 100% probability that the notes will be selected from the harmonic series and when the bar is on the right side there is a 100% probability that the notes will be selected from the synthetic scale. This transition will last as long as the number of milliseconds indicated in the number box. Once the bar has moved to the rightmost edge of the slider the performer can click the button again to create a transition back to the harmonic series.

After opening the performance patch, pressing the number "2" on the keyboard in the main window will open the sub-patch where one controls the second layer or "Voice 2". Figure 8 shows a screen shot of this sub-patch.

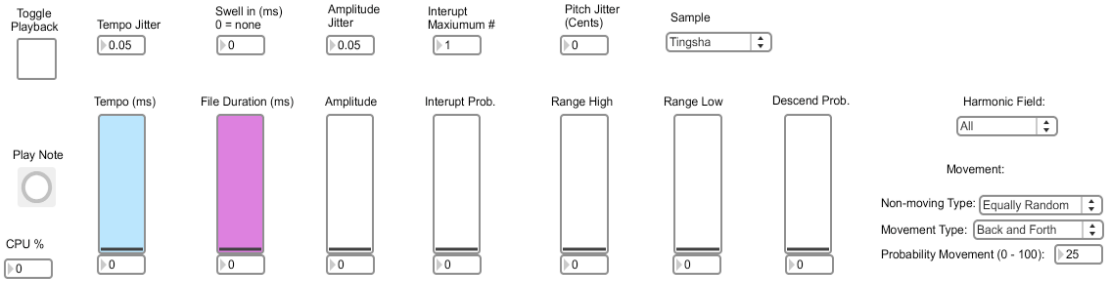


Figure 8: The sub-patch window that the performer uses to control "Voice 2"

The controls in "Voice 2" are nearly identical to those in "Voice 1." The exceptions to this are that the controls operate on a different layer and "Voice 2" has no control to allow for the transition between a harmonic series and the synthetic scale.

Pressing the number "3" on the keyboard in the main window will open the sub-patch where one controls the Melody layer. Figure 9 shows a screen shot of this sub-patch.

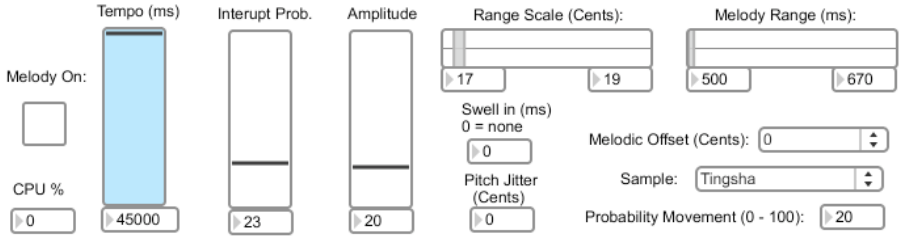


Figure 9: The sub-patch window that the performer uses to control the Melody layer

The parameters in this window correspond to those listed in Table 2 above, Table 1, and the description of the Tibetan bells spatialization algorithms. Similar to the Voice layers, the performer must first initialize the values and the click the toggle under "Melody On" to turn on the Melody layer. In this sub-patch, the performance patch uses preset and randomly selects ranges of values to the determine the attributes for

unlisted algorithm parameters such as the Tempo Jitter, Interrupt Maximum, and Amplitude Jitter.

Pressing the number “4” on the keyboard in the main window will open the sub-patch where one controls the five different tam-tam layers. Figure 10 shows a screen shot of this sub-patch.

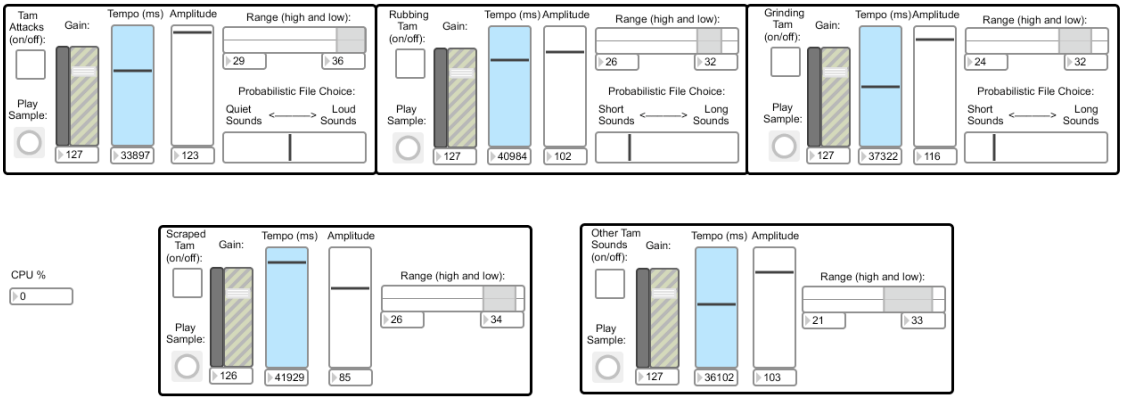


Figure 10: The sub-patch window that the performer uses to control the tam-tam layers

Each one of the categories of tam-tam recordings described above corresponds to a tam-tam layer. Rounded black boxes group each layer’s controls together and the text over the toggle indicates which tam-tam category the controls correspond to.

Each layer has an on/off toggle, a button that immediately triggers a sound file, a gain~ slider and corresponding meter to allow for continuous dynamic control, a Tempo slider, an Amplitude slider that generally determines the initial amplitude of the sounding samples, and a high and low Range slider. The Tam Attacks, Rubbing Tam, and Grinding Tam layers have an additional slider that determines the probability of which sub-category will sound so that, for example, in the Rubbing Tam layer in Figure 10 there is a greater probability that the softer recordings will sound. Within the

chosen sub-category, or when no sub-category is specified the performance patch uses an equal probability to randomly select which sample sounds.

The graphic score for *across an ocean, across the land…* provides grand staves, dynamics, text descriptions, and time brackets for each algorithmic layer. A text to the left of each staff identifies the name and instantiation of each layer (e.g. Voice 1, Voice 5, Melody 1, Melody 2, etc.) in same way that a conventional orchestral score identifies which staff provides the notes for each instrument.

The grand staff for every layer to provide notes and index numbers for the high and low limits of the algorithm's ranges. Lines between these notes indicate a gradual transition to new limits. A lack of lines between these notes indicates that the limits should stay the same until another line enters or the layer stops.

Also, similar to conventional notation, dynamics and dynamic swells are indicated using conventional music symbols such as ***ff***, ***mp***, ø, ***cresc.***, or ***ppp sempre***. When no notes or a rest are given for a layer, the layer is silent and therefore non-active.

A short arrow inside a parenthesis that points within a range of 90˚ to 180˚ indicates approximate values for the Descending Probability parameter. For example, if arrow points at 90˚ there the Descending Probability parameter should have a value of 0, where as if it is pointing to about 135% there the parameter should have a value of about 50.

All other parameters are indicated through text descriptions directly about the corresponding grand staff and usually at the beginning of a time bracket (see below).

The "–" symbol indicates a range of possible values for a parameter. For example, ***f-mf*** indicated that the notes should sound within a range between *forte* and *mezzo-forte*. During performance, the performers can search for the most accurate way to represent this range and consistently adjust the parameter within the defined extremes looking for the most musically acceptable results.

The graphic score uses the time-bracket method, most notably used by John Cage in his late number pieces, to specify duration. In this notational method a bracket stretches over a measure of material to indicate the range of time when the music played within the bracket can begin and end. Within these brackets, time is otherwise represented in a time-space notation where the geometric space between events is equal to the duration between events.

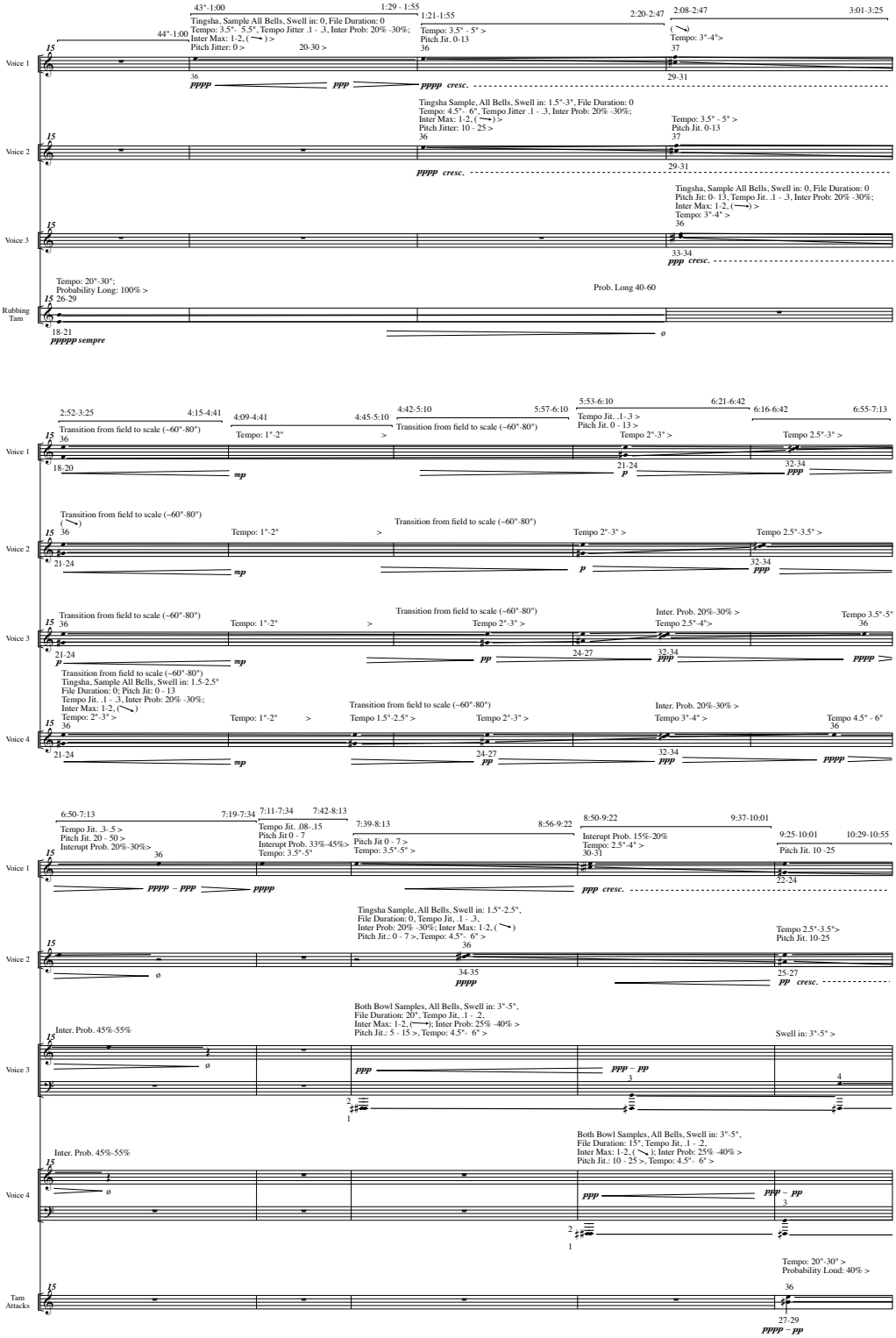
If a parametric value is followed by the symbol ">" implies that the performer should gradually transition to the following parametric value. This transition can happen either slowly; by steps whereby the performer advances an increment towards the and then waits some before advancing another increment again; or by gradually moving towards and slightly away from the destination, so that one experiments with how the changes effect the composite sound. This said, in all instances the transitions should aim to be gradual, smooth, virtually seamless, and end when the new value is specified in the score. If a parametric value is not followed by ">", this means that the value should remain fixed until a change is specified.

Lastly, it must be noted that the timings in this work are approximate. In an ideal performance, the performers should rehearse so much that they do not need a

score or a stopwatch to perform the work. In this ideal situation, the time brackets become suppler, the transitions more blurred yet smooth, and overall the entire structure can be scaled to either a shorter or longer duration than what is specified in the score. This scaled structure can then be based upon how the computer manifests the algorithms and how the ensemble and audience interact with these manifestations.

across an ocean, across the land…

Jacob David Sudol



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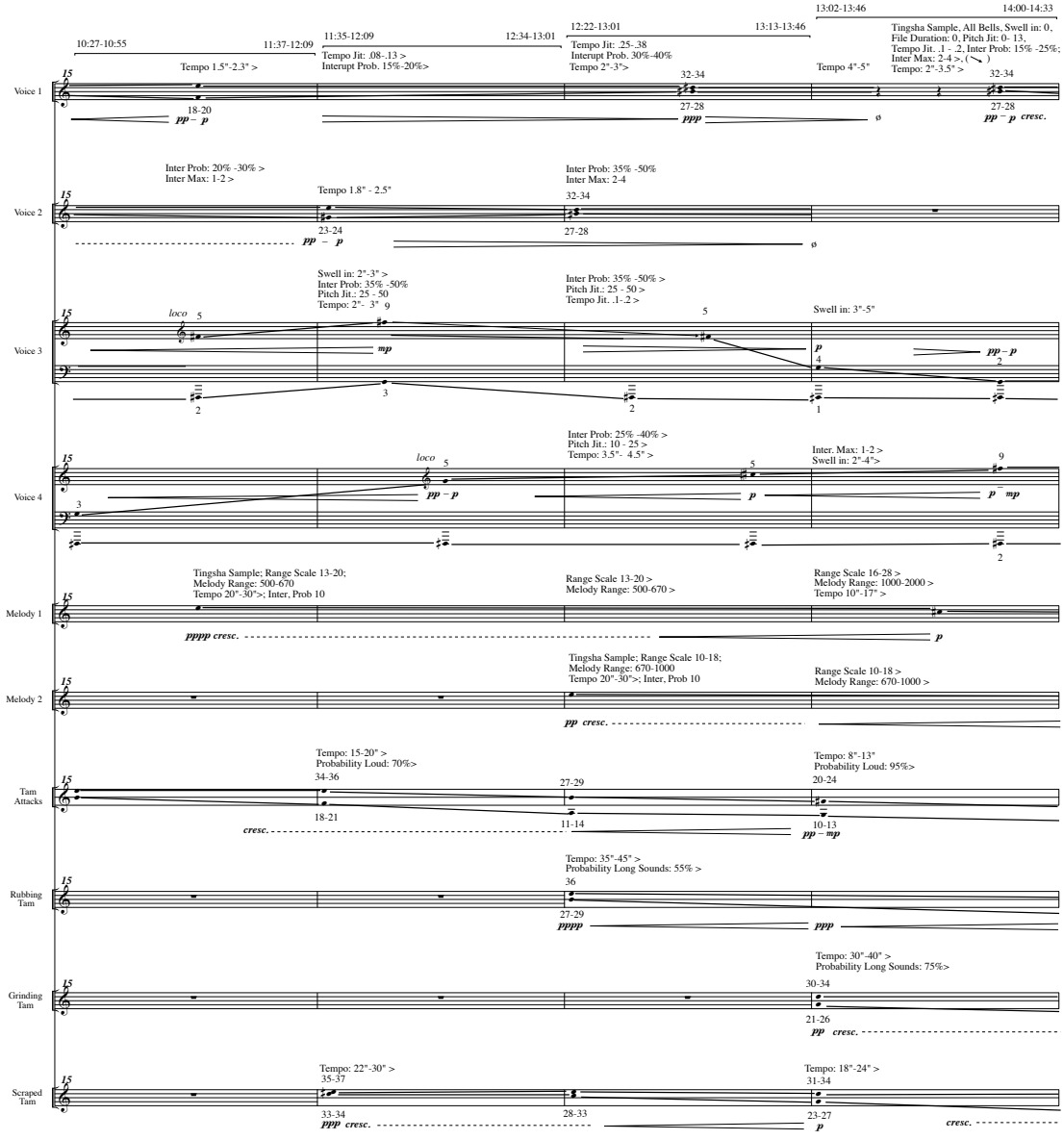

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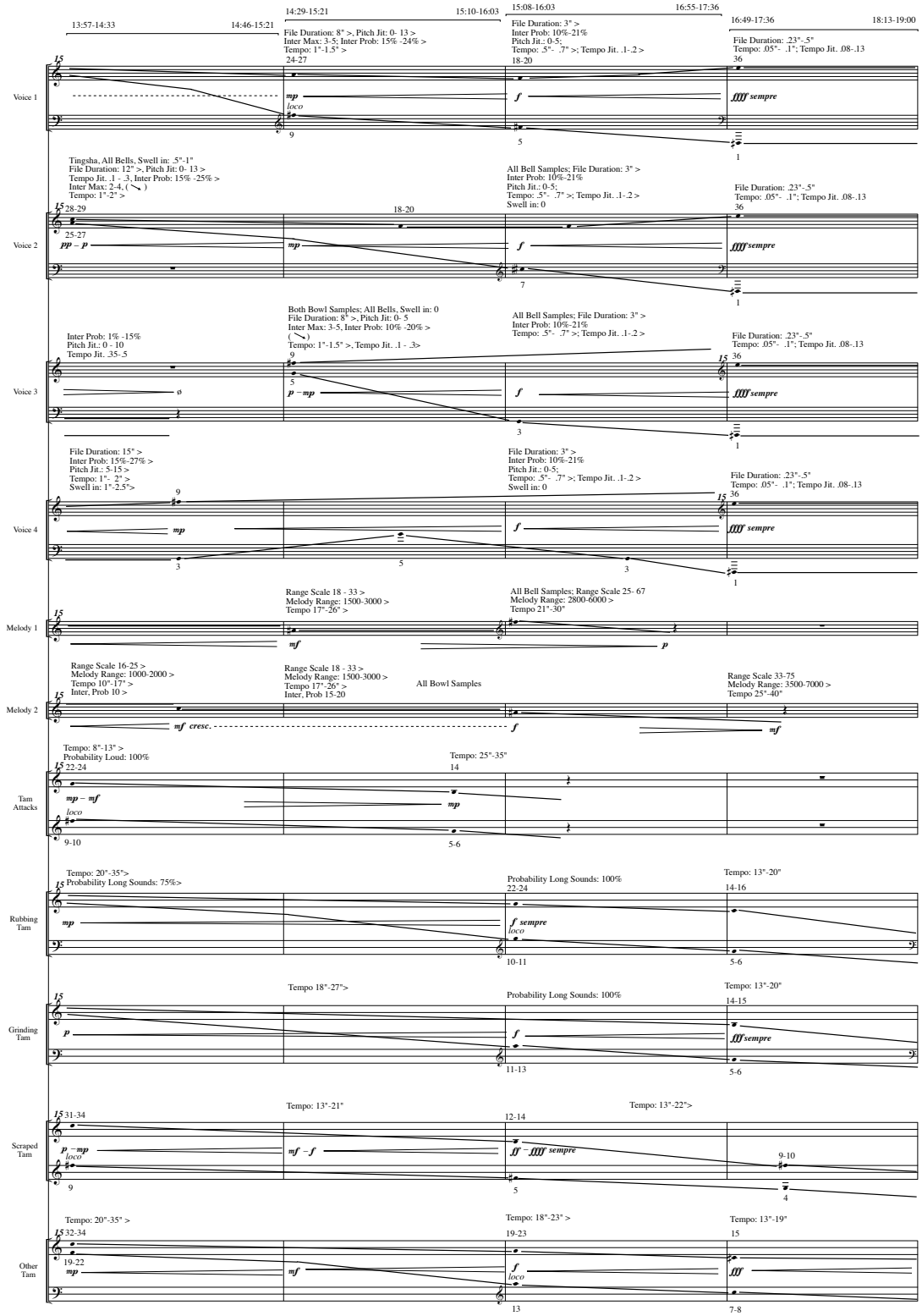

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