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### Title

Flint

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flint  
for ensemble mosaik

by

Rama Jesse Gottfried

A dissertation submitted in partial satisfaction of the  
requirements for the degree of

Doctor of Philosophy

in

Music

and the Designated Emphasis

in

New Media

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Franck Bedrossian, Chair

Professor Edmund Campion

Professor Cindy Cox

Professor Gregory Niemeyer

Spring 2015



## Abstract

flint  
for ensemble mosaik

by

Rama Jesse Gottfried

Doctor of Philosophy in Music

and the

Designated Emphasis in New Media

University of California, Berkeley

Professor Franck Bedrossian, Chair

Striking flint rock against iron pyrite, tiny sparks leap from seemingly nowhere into existence. Like the combination of sounds, when a spark contacts flammable material a flame forms; expanding and transforming as it grows, feeding itself on the material, continuing until it has released as much of the material's content as it can before diffusing into the air.

The machinery of life follows a similar progression – from the microscopic drama of atoms, cells, neurons, leaves, amoebas, and digital bits – to the macro-scale drama of lives, societies, and universe-sized ecosystems.

The piece *flint* for ensemble mosaik, is not universe-sized, but instead is comprised of millions of microscopic lives and deaths in sound.

By magnifying these most minuscule of sonic gestures through extreme amplification and human computer interaction instrument systems, the work extends the gestures of the ensemble and reaches into the space around the listeners.

*flint* was premiered by ensemble mosaik at the Bluderzer Tage zeitgemäßer Musik Festival in Bludenz, Austria, November 2014.

for Sophie

## Acknowledgments

I dedicate this dissertation to my family who has supported me through many years of study, and especially to my amazing wife Celeste who has given me the courage to keep going whenever doubts creep in, and my daughter Elodie who reminds me of the importance of play.

I would like to also acknowledge the many teachers I have had through my academic career, starting with T.L Read, and Ernest Stires who told me I was a composer, Justin Dello Joio, Nils Vigeland, Marc Sabat, and Walter Zimmermann.

In particular, I would like to acknowledge the intellectual engagement of the faculty at UC Berkeley: David Wessel, Edmund Campion and Adrian Freed at the Center for New Music and Audio Technologies who have guided my work and holistic growth as an artist and technologist; Franck Bedrossian whose careful listening and thoughtful reflections have greatly refined my aesthetic handling of material; and at the Berkeley Center for New Media, Abigail De Kosnik and Greg Niemeyer who helped expand my artistic and scholarly thinking putting me in dialog with other graduate students from many other backgrounds.

Thank you.

instrumentation:

piccolo with internal mic, handheld speaker  
oboe with internal mic, handheld speaker  
clarinet in Bb with internal mic, handheld speaker  
soprano saxophone with close mic, handheld speaker

percussion:

close mic:  
plant pot base  
cleaning brush on bongo drum  
2 rocks  
cymbal with contact mic  
midi pedals (see schematic)

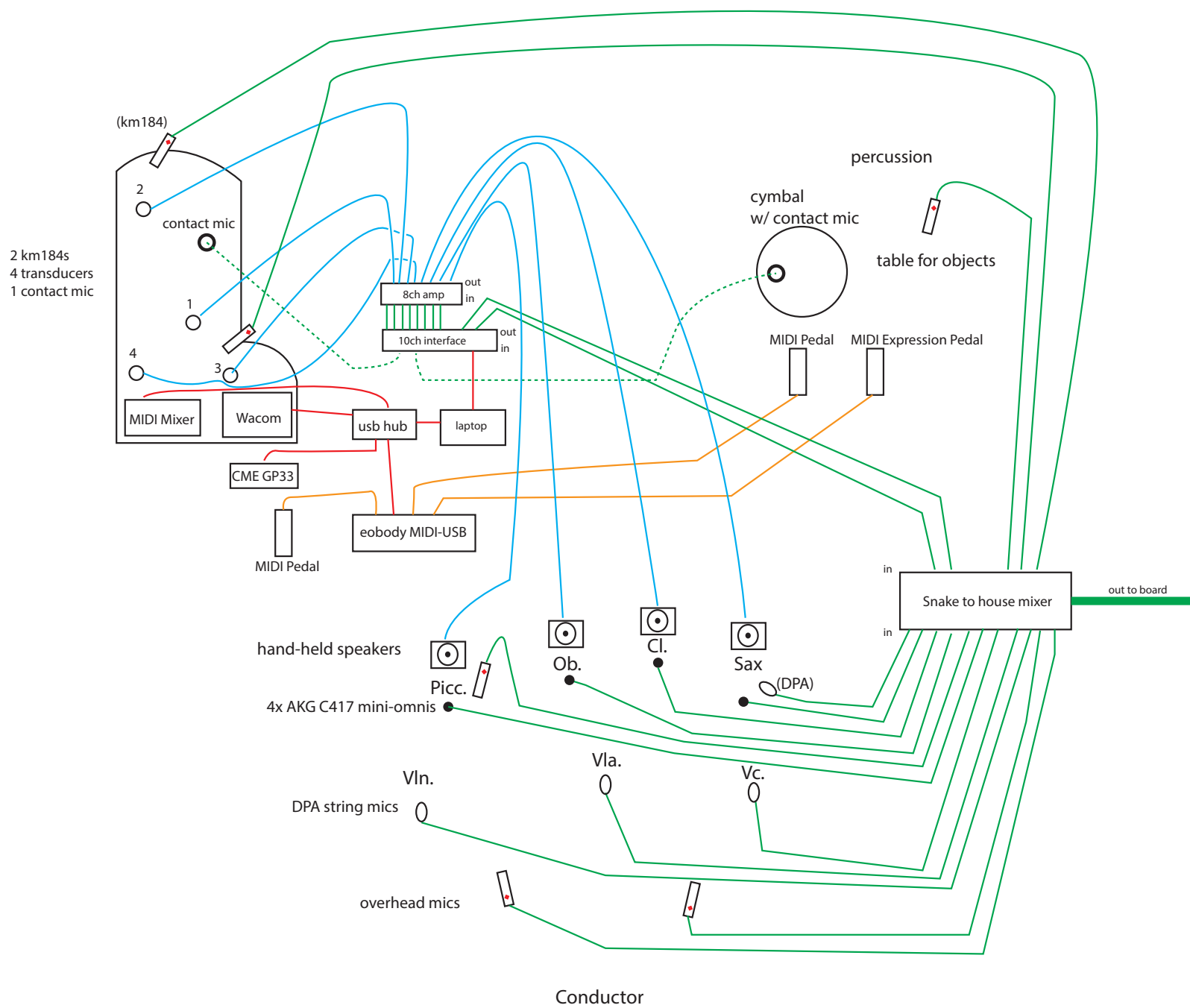
piano:

wacom tablet computer interface  
4 transducers  
attached to various objects sitting on piano strings:  
wooden frog  
tibetian bowl  
piece of wood  
unattached ping-pong balls  
midi pedals and mixer (see schematic)

violin  
viola  
violoncello

duration: ca. 12 minutes

schematic



- audio cables
- speaker cable
- MIDI pedal cable (1/4")
- computer cables (usb or firewire)





note:

for best results all winds should have compression and EQ to create a highly flat, electronic sound. boost extreme low and high frequency ranges for maximum boom and click.

- MacBook Pro
- Wacom tablet
- MIDI mixer (UC-33, BCF2000 or sim)
- CME GP33 Foot pedal
- eobody MIDI-USB
- 2x MIDI Pedals
- 1x MIDI Expression pedal
- USB hub
  
- 10ch audio interface (FF800 or sim)
- 8ch amplifier
  
- 4x small transducers (Dayton Audio)
- 6x KM184 (or sim)
- 4x AKG C417 (or sim)
- 3x string DPA (or sim)
- 1x sax DPA (or sim)
- 2x contact mics
- 4x small handheld speakers (with housing)

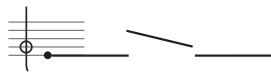


# piccolo

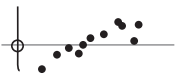
-  equal temperament (ET)
-  ±14 cents from ET
-  ±31 cents from ET
-  ±50 cents from ET



relative pitch of keyclick/air-noise around held note. where the held note continues, there should also be a click.



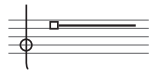
relative key glissando from held note.



relative pitch of fingering/click, relative to the G on the treble cleff.



light air tone not on staff, slight to no pitch



light air tone on staff, slightly more tone than above



heavy air tone, forceful air pressure, with mouth covering embouchure.

## amplification:

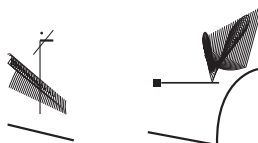
a small omni-directional microphone should be placed inside the instrument, wrapped with plastic-wrap to avoid water damage. for the piccolo, the mic should be placed inside the end of the instrument, and secured with a rubber band to keep the mic in place. the gain to the PA speakers should be quite loud, and should be compressed, and EQ'd with boosts in the very low and very high ranges -- as loud as possible without feeding back. some distortion is desirable, for example, with the "heavy air tone".

## graphic notation:

for some techniques in the piece, graphic notation is used to visually describe the resulting sound. in general, the vertical position of a shape refers to the relative pitch of the sound, while the vertical width and darkness of the shape indicates the relative loudness of the sound. the internal variations of each shape indicate that a change in quality should be apparent, for instance this might possibly achieved by changing the embouchure shape.



flutter-whistle tone: fluttertongue technique with throat plus whistletone, a high frequency sound, with a bouncing rhythm a bit like a small stone skipping on water



motor sound: a low-pitch fluttertongue technique with throat, with the mouth completely covering the embouchure hole. the resulting sound should be something like a motorcycle. usually combined with keyclick glissando, and heavy air sound. see also the general graphic notation explanation.



ingressive, lip sound very high pitch with irregular rhythm, and density. here, the staccato 16th note at end indicates as sharp ending point.







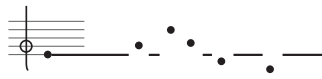
staccatissimo, dead tongue sound, click-like.



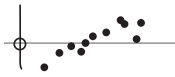
*sfz*  
staccatissimo, pizzicato

# oboe

-  equal temperament (ET)
-  ±14 cents from ET
-  ±31 cents from ET
-  ±50 cents from ET



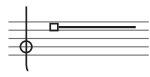
relative pitch of key fingering/click around held note. where the held note continues, there should also be a click.



relative pitch of fingering/click, relative to the G on the treble clef.



light air tone not on staff, slight to no pitch



light air tone on staff, slightly more tone than above, should be an "almost" pitch, with a light, unstable grittiness.



air fluttertongue with relative pitch keyclick glissando

## amplification:

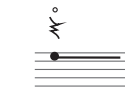
a small omni-directional microphone should be placed inside the instrument, wrapped with plastic-wrap to avoid water damage. for the oboe, the mic should be placed inside instrument approximately at the mid point, and secured with a rubber band by the cable at the bell to keep the mic in place. the gain to the PA speakers should be quite loud, and should be compressed, and EQ'd with boosts in the very low and very high ranges -- as loud as possible without feeding back.

## graphic notation:

for some techniques in the piece, graphic notation is used to visually describe the resulting sound. in general, the vertical position of a shape refers to the relative pitch of the sound, while the vertical width and darkness of the shape indicates the relative loudness of the sound. the internal variations of each shape indicate that a change in quality should be apparent, for instance this might possibly achieved by changing the embouchure shape.



"geiger-counter": staccatissimo, ingressive breath, dead tongue sound, very short click sounds. possibly best produced with strong embouchure pressure, with the reed at the side of the mouth.



air fluttertongue -- even though the notehead is black here, the result should be a bit more pitch than the light air-tone on the staff, but not a full bodied pitch.



ingressive, lip sounds very high pitch with irregular rhythm, and density. in example "a" the staccato 16th note at end indicates as sharp ending point. example "b" is similar, but with more interpretive variation. see also the general graphic notation explanation.

# clarinet Bb

b $\sharp$  equal temperament (ET)

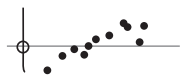
b $\sharp$   $\pm 14$  cents from ET

b  $\pm 31$  cents from ET

d  $\pm 50$  cents from ET



relative pitch of keyclick/air-noise around held note. where the held note continues, there should also be a click.



relative pitch of fingering/click, relative to the G on the treble cleff.

□ light air tone not on staff, slight to no pitch



light air tone on staff, slightly more tone than above, should be an "almost" pitch, with a light, unstable grittiness.



air fluttertongue with relative pitch keyclick glissando



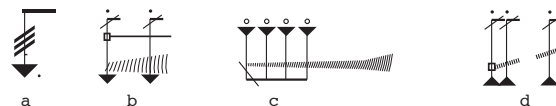
ingressive, lip sounds very high pitch with irregular rhythm, and density. in example "a" the staccato 16th note at end indicates as sharp ending point. example "b" is similar, but with more interpretive variation. see also the general graphic notation explanation.

## amplification:

a small omni-directional microphone should be placed inside the instrument, wrapped with plastic-wrap to avoid water damage. for the clarinet, the mic should be placed inside the middle of the instrument, and secured with a rubber band or tape to keep the mic in place. the gain to the PA speakers should be quite loud, and should be compressed, and EQ'd with boosts in the very low and very high ranges -- as loud as possible without feeding back.

## graphic notation:

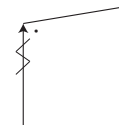
for some techniques in the piece, graphic notation is used to visually describe the resulting sound. in general, the vertical position of a shape refers to the relative pitch of the sound, while the vertical width and darkness of the shape indicates the relative loudness of the sound. the internal variations of each shape indicate that a change in quality should be apparent, for instance this might possibly achieved by changing the embouchure shape.



- a: slap-tongue tremolo, many many slap-tongues, as fast as possible
- b: staccatissimo tongue slaps, with fluttertongue (throat) air at the same time
- c: air fluttertongue (throat) with short, slap-tongue multiphonics (overtones)
- d: ingressive air sound, with staccatissimo ingressive slap-tongue



"whistlers" -- very high whistle-like sounds, produced with lots of embouchure and air pressure, plus a little spit on the reed. depicted graphically -- see also the general graphic notation description.



teeth on reed -- very high whistle sound

# soprano saxophone

b $\sharp$  equal temperament (ET)

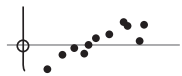
b $\sharp$   $\pm 14$  cents from ET

b  $\pm 31$  cents from ET

d  $\pm 50$  cents from ET

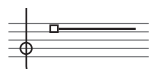


relative pitch of keyclick/air-noise around held note. where the held note continues, there should also be a click.



relative pitch of fingering/click, relative to the G on the treble clef.

□ light air tone not on staff, slight to no pitch



light air tone on staff, slightly more tone than above, should be an "almost" pitch, with a light, unstable grittiness.



air fluttertongue with relative pitch keyclick glissando



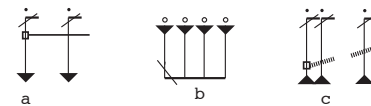
ingressive, lip sounds very high pitch with irregular rhythm, and density. in example "a" the staccato 16th note at end indicates as sharp ending point. example "b" is similar, but with more interpretive variation. see also the general graphic notation explanation.

## amplification:

the saxophone uses a DPA mic, with gooseneck clip mounted on the instrument so that mic is over the keys, approximately at the mid-point between the two hands. the gain to the PA speakers should be quite loud, and should be compressed, and EQ'd with boosts in the very low and very high ranges -- as loud as possible without feeding back.

## graphic notation:

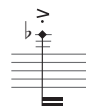
for some techniques in the piece, graphic notation is used to visually describe the resulting sound. in general, the vertical position of a shape refers to the relative pitch of the sound, while the vertical width and darkness of the shape indicates the relative loudness of the sound. the internal variations of each shape indicate that a change in quality should be apparent, for instance this might possibly achieved by changing the embouchure shape.



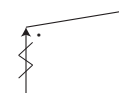
- a: staccatissimo tongue slaps, with fluttertongue (throat) air at the same time
- b: short, slap-tongue multiphonics (overtones)
- c: ingressive air sound, with staccatissimo ingressive slap-tongue



"spit whistlers" -- a percussive fluttertongue sound, produced by adding a little spit into the reed and angling the bell of the instrument upwards, so as to keep the water in the reed. the resulting sound should not sound like heavy gurgling, but a light, somewhat transparent pitched sound. depicted graphically -- see also the general graphic notation description.



staccatissimo, dry slap-tongue

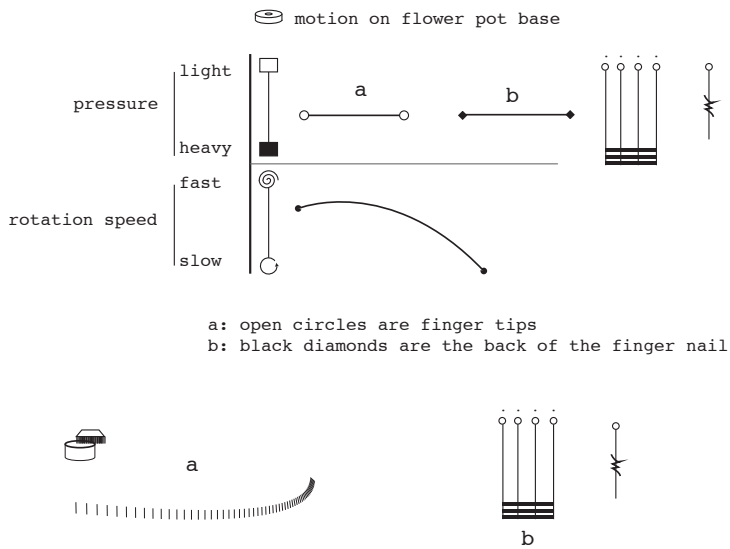


teeth on reed -- very high whistle sound

## percussion

hard brush on bongo  
flower pot base  
two rocks  
bowed cymbal with contact mic

amplification:  
at least two mics are used, one or two for the flower pot base, brush on bongo, and rocks -- a contact mic is taped to the cymbal and is routed into the piano/wacom computer interface.



hand brush on bongo drum -- three main sounds are used:  
(1) a gradient of rhythms created by moving the bristles against the drum head at different speeds and pressures, from sparse clicks, to white noise,  
(2) changing the relative pitch of the bristles, by using the other hand to alter the resonance of the drum head, and  
(3) rubbing the handle of the brush (smooth plastic) against the drum head to produce a slightly more pitched noise sound, the frequency of which is controlled by rubbing closer or further from the rim of the drum head.

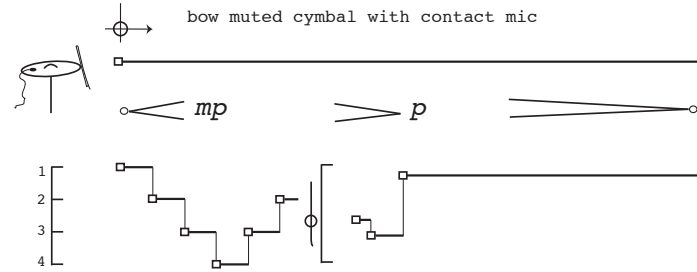
a: bristle sounds with graphically depicted results -- the relative vertical position indicates pitch, and the horizontal density indicates rhythm and loudness.  
b: open circles are used for the brush handle

midi pedals:

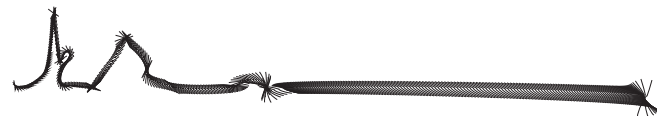
1) section pedal changes the presets used in the wacom instrument  
2) a midi expression pedal is used to jump the cymbal sound between transducers in the first sections, and later between hand-held speakers.

graphic notation:

for some techniques in the piece, graphic notation is used to visually describe the resulting sound. in general, the vertical position of a shape refers to the relative pitch of the sound, while the vertical width and darkness of the shape indicates the relative loudness of the sound. the internal variations of each shape indicate that a change in quality should be apparent, for instance this might possibly be achieved by changing the resonance of the drum head, the amount of pressure used, or speed of motion.



while bowing the muted cymbal, move expression pedal to jump between transducers in the piano. in the second part of the piece, the sound jumps between hand-held speakers on stage.



press two rocks against each other with varying degrees of speed and pressure, using the graphic notation as a general guide for relative pitch and intensity.

## wacom/transducer/piano instrument

on top of the piano sits a multi-touch wacom tablet fitted with a tactile surface in a simpler pattern to a two manual keyboard. the finger motions are sent into a computer running max/msp used as an impulse sound source for signals sent from the computer through four transducers sitting on the strings of the piano. see also the technical layout description for more indepth layout. the wacom part is the central electronics source in the piece.

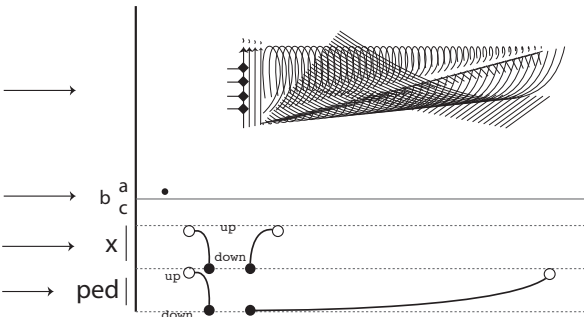
graphic notation is used in the wacom/piano part to visually describe the resulting sound as well as the gesture of the fingers, hands and arms on the tablet surface. in general, lines which are more vertical in orientation are used for more dry staccato like textures, while sounds that have more continuity (e.g. longer FM sounds) have more of a horizontal orientation. the approximate vertical center of a shape indicates a relative pitch, and the relative height/size of a shape indicates its intensity, and granular density.

graphic notation aims to describe the gesture of the hands/arms as well as the resulting sound

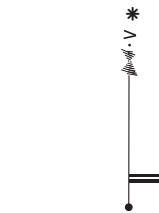
three sound types per section preset

synthesis/feedback crossfade

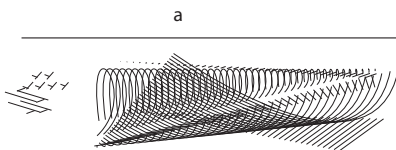
piano sustain pedal



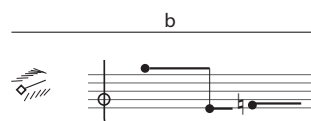
distorted test-tone beep



basic sound types:

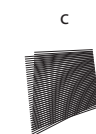


dry, percussive granular sounds

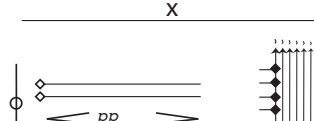


pitched, or semi pitched granular sounds.

for notated pitches, keyboard range is from C below middle C, to C above the staff.

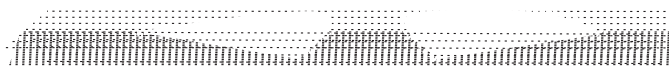


highly modulated, more continuous FM sounds



extreme feedback pitches to the point that the transducers jump up and down on the strings

recording of a large group of people talking filtered with wacom interface and played into transducers into the piano



# strings

- equal temperament (ET)
- ±14 cents from ET
- ±31 cents from ET
- ±50 cents from ET
- light to normal bow pressure
- heavy bow pressure
- mute

amplification:  
all strings should have DPA mics attached -- amplified sound should be balanced and clean, mixed with the rest of the ensemble

light pressure

bow position on string, higher indicates closer to bridge, closer to note means more sul tasto

bow on the edge of where the note begins to emerge

pressed bow gestures:

a: press bow wood into hairs into string and twist, creating a granular pitched sound

b: drag bow vertically on string with strong pressure

c: semi-circular bowing, from light horizontal molto sul tasto bowing, to pressed vertical bowing up to the bridge (ob = on bridge)

d: heavy pressure and slow bowing that produces one pitched click at a time.

col lengo:

clb

mp

finger sounds:

string fingers on string as loud as possible, so that some pitch is audible between finger and nut.

violin & viola:

interlocking col lengo jete, between violin and viola to create a semi continuous texture

violoncello:

a: "extended gravity jete", where bow bounces for a very long time, using the weight of the bow to keep it bouncing. speed and bow position are indicated graphically.

b: "one hair" from the bow is pressed into the string and dragged vertically, creating little pitched clicks as it chafes against the grains in the string.

# handheld speakers



at a climatic moment in the piece, the winds put down their instruments and stand holding hand held speakers. at first the sound coming out of the speakers is a mezzoforte white noise. as the performers slowly move the speakers through the air we hear soft aliasing and cancellation effects. there is a short interruption by the ensemble at rehearsal number 44, and then after another section of white noise, the ensemble enters again -- the white noise is cut and replaced with the amplified sound of the percussion. for a long period of time, only the percussion comes through the handheld speakers until the last section (59-64), where the piano/wacom instrument shifts from the transducers into the speakers, and ends with high sinewaves also in the speakers.

the moments of the speaker performers should be as unified as possible; very smooth, somewhat majestic, yet impersonal, like robots. transitions between poses are notated, where arrows continue between positions, there should be no stop, but a fluid continuation, to the next location.

transposed score

# flint

rama gottfried 2014

♩ = ca. 66

1 2 4 3 1 10"

4 4 4 4 4 4

picc

pp p sf sfz p pp p sf p pp

ob

c1 (Bb)

pp pp sempre

s sax (Bb)

sfz sfz sfz sfz

PA: mp

plant pot base, w/ nail

perc

pno

b a c x |

ped

1 2 4 3 1 10"

4 4 4 4 4 4

vln

sf sffz mf sffz sf sf sffz

vla

sf sffz mf sffz f sffz

vc

pp pp

I/II I/II I/II

pizz pizz pizz pizz

clb 8 clb 8 clb 8

1

10" 1  
4

musical notation: piano staff with notes and dynamics (*mp*, *p*, *ppp*); transducer pedal staff with a 4-position switch labeled "transducer ped. pedal"; foot pedal staff with waveforms and dynamics (*pp*, *mp*, *... sim.*).

10" 1  
4

musical notation: piano staff with notes and dynamics (*pp*, *mp*, *... sim.*); transducer pedal staff with a 4-position switch labeled "transducer ped. pedal"; foot pedal staff with waveforms and dynamics (*pp*, *mp*, *... sim.*).

2

1 4 4 3 2 1 1  
4 4 4 4 4 4 4

*sfz* *mp sf* *pp* *sfz* *pp* *sfz* *pp*

*duo* *duo*

b a c  
X  
ped

1 4 3 2 1 1  
4 4 4 4 4 4 4

*pizz* *clb* *pizz* *clb* *I/II* *pizz* *clb* *pizz* *IV* *pizz* *IV*

*p* *sffz* *p* *sffz* *p* *sf* *p* *sffz* *sffz*

*pizz* *I/II* *pizz* *I/II* *pizz*

*ppp sempre*

3

1 5 4 1 10"

4 4 4 4 4

*mp sf* *pp* *mp* *pp*

*sfz*

3 5

a b c

X

ped

Detailed description: This system contains five staves. The top staff is a piano part with dynamics *mp sf*, *pp*, *mp*, and *pp*. The second staff is a piano part with various articulations. The third staff is a piano part with triplets (3) and quintuplets (5). The fourth staff is a piano part with a *sfz* dynamic. The fifth staff is a percussion part with various rhythmic patterns and dynamics. The system is marked with measures 1, 5, 4, and 1, and a 10" time signature.

1 5 4 1 10"

4 4 4 4 4

*sffz* *sf* *p* *sf* *p*

*pizz* *I/II* *clb* *I/II* *clb* *pizz*

*sf* *p* *sf* *sffz*

3 5

Detailed description: This system contains five staves. The top staff is a piano part with dynamics *sffz*, *sf*, *p*, *sf*, and *p*. The second staff is a piano part with dynamics *sf* and *p*. The third staff is a piano part with dynamics *sf* and *sffz*. The fourth staff is a piano part with dynamics *p* and *sffz*. The fifth staff is a percussion part with various rhythmic patterns and dynamics. The system is marked with measures 1, 5, 4, and 1, and a 10" time signature.

4



10" 1  
4

plant pot base, w/ fingertips  
*ppp*

transducer pan pedal

1  
2  
3  
4

*mp* *p* *pp* *ppp*

*pp* *mp* ... *sim.* *sffz* *pp*

b  
c  
x  
ped

10" 1  
4

*pp* *mp* ... *sim.* *sffz* *pp*

b  
c  
x  
ped

5

1 4 5 4 4 1 3 32

sfz p p sf sfz

3 5

a b c X ped

1 5 4 1 3 32

pizz sffz sf I/II sf I/II pizz sffz

pizz clb 8 p 8 p

3 5

6

3 3 3 3 15"

32 2 32 4

Violin I: *sfz p sfz sfz*

Violin II: *ppp ppp*

Cello/Double Bass: *fff sfp sfz sfz sfpp*

Double Bass: *blend with cello pp sempre*

1

b a c X ped

3 3 3 3 15"

32 pizz 2 32 pizz 4

Violin I: *sfz sfp fff sfz sfz*

Violin II: *sfz sfp fff sfz sfz*

Double Bass: *(p)*

Performance instructions: *mute string with bow*, *ob*, *mst*

7

15"

10"

This system contains the first five staves of a musical score. The top staff is a violin part with a melodic line. The second staff is a viola part, starting with a dynamic marking of *mp* and a hairpin indicating a crescendo. The third and fourth staves are piano accompaniment, featuring a steady eighth-note pattern. The fifth staff is a piano pedal part, showing a series of vertical lines representing pedal points. Below the pedal staff are labels for fingerings: 'b', 'a', 'c', 'x', and 'ped'.

15"

10"

This system contains the next five staves of the musical score. The first two staves are violin and viola parts, both marked with *8va* (octave up) and *15 8va*. Each staff includes a box containing the abbreviations 'vln', 'clb', and 'vla' with arrows pointing to specific notes, and the text '...sim.' indicating a simile. The third staff is the piano accompaniment. The fourth and fifth staves are piano parts, with the fifth staff featuring a hairpin indicating a crescendo.

8

10" 3-4" *fff* 3 32

3-4" *fff*

3-4" *sff* *mp* *f*

3-4" *sfz*

3-4" 2 rocks, crushed against each other

2 solo 3-4" *fff*

b a c x ped

10" 3-4" *pizz* *sfz* 3 32

3-4" *pizz* *sfz*

3-4" *pizz* *sfz*

3-4" *pizz* *sfz*

9



10"

fff

*p*  $\rightarrow$  *ff*      *p*  $\rightarrow$  *ff*

*sff*

b a  
c  
x  
ped

10"

11

Musical score for a piano, featuring several systems of staves. The first system includes dynamic markings *p* and *ff*, with a crescendo hairpin. The second system shows a long, dense horizontal line with a small upward-pointing arrow at the beginning. The third system contains rhythmic notation with stems and flags. The fourth system is a long, wavy horizontal line. The fifth system includes a *fff* marking and complex graphical patterns. The sixth system has labels *b*, *a*, *c*, *x*, and *ped* on the left, with a line of notes and a dotted line below. The score concludes with a double bar line and the number 32.

3  
32

3  
32



3 7 5 8 3 5 2 7 10"

32 8 32 8 32 8 32 8

*fff*

*p*

*f sempre*

*p* *mf* *p* *mf* *p*

b  
c  
x  
ped

3 7 5 8 5 2 7 10"

32 8 32 8 32 8 32 8

*p* *mf* *sfz* *ob* *mst*

*p* *mf* *sfz* *ob* *mst*

*p* *mf* *sfz* *ob* *mst*

13

10"

*p*  $\rightarrow$  *ff*      *p*  $\rightarrow$  *ff*      *fff*

*sff*

*sfz*

b a c  
x  
ped

10"

*pizz*  $\rightarrow$  *sfz*

*pizz*  $\rightarrow$  *sfz*

*pizz*  $\rightarrow$  *sfz*

14

10"

1  
4

pp

mp

p

ppp

plant pot base, w/ fingertips

transducer ped. 1  
2  
3  
4

3

pp

mp

... sim.

ped

... sim.

10"

1  
4

ped

15



3 3 3 3 10"

32 2 32 4

*sfz* *p* *sfz* *sfpp*

*ppp* *ppp*

"*fff*" *sfp* *sfz* *sfpp*

blend with cello  
*pp sempre*

4

b  
c  
x  
ped

3 3 3 3 10"

32 pizz 2 3 32 pizz 4

*sfz* *sfz* *sfz* *sfz*

*sfz* *sfz* *sfz* *sfz*

*sfz* *sfz* *sfz* *sfz*

ob  
mst

17

10"

Musical score for the first system. The top staff is a piano part with dynamics *pp* and *p*. Below it are three empty staves. At the bottom is a grand staff with a pedal line labeled "ped" and a sequence of notes labeled "b", "a", "c", and "x".

10"

Musical score for the second system. It includes detailed annotations: "clb IV", "8va", and "I". A box contains the text "vln, clb, ...sim." and "vln, vla". The piano part has dynamics *p*. Below the piano part is a grand staff with a thick, shaded line.

18

10"

The first system of the musical score consists of several staves. The top staff is a grand staff with a treble clef and a common time signature. Below it are several staves with various notations. A dynamic marking of *pp* (pianissimo) is present in the third staff. A *sfz* (sforzando) marking is in the fifth staff. There are also performance instructions: *ped* (pedal) and *x* (possibly a breath mark or similar) in the bottom staves. The notation includes a series of vertical lines, possibly representing a tremolo or a specific rhythmic pattern.

10"

The second system of the musical score consists of several staves. The top staff is a grand staff with a treble clef and a common time signature. Below it are several staves with various notations. A dynamic marking of *pp* (pianissimo) is present in the third staff. There are also performance instructions: *ped* (pedal) and *x* (possibly a breath mark or similar) in the bottom staves. The notation includes a series of vertical lines, possibly representing a tremolo or a specific rhythmic pattern.

19

15"

ped

preset: farthest finger from others sets pitch

15"

8va

15 8va

8va

15 8va

20



10"

3  
32

b a  
c  
x  
ped

10"

3  
32

21

3 3 3 3 10"

32 4 32 2

*sfz*

*sfz p sfpp*

*ppp*

*ppp*

4

"*fff*"

*sfz*

*sfp*

*sfz*

4

(*pp*)

b  
a  
c  
x  
ped

3 3 3 3 10"

32 4 32 2

*sfz*

*sfz*

*fff*

*fff*

*sfz*

*sfz*

ob

mst

3

3

10" 3-4" *fff* 3 32

3-4" *fff*

3-4" *sff* *mp* *f*

3-4" *sfz*

3-4" 2 rocks, crushed against each other

5 solo 3-4" *fff*

b a c x ped

10" 3-4" *pizz* *sfz* 3 32

3-4" *pizz* *sfz*

3-4" *pizz* *sfz*

3-4" *pizz* *sfz*

23



2 7 8 3 5 7 3 6  
8 32 8 32 8 32 8

*fff*

*p* *p* *mf* *p* *mf* *p*

b a c  
x  
ped

2 7 8 5 7 3 6  
8 32 8 32 8 32 8

*sfz* *sfz* *sfz*

*mst* *mst* *mst*

*ob* *ob* *ob*



3 2 5 1 5 2 3 1 3 5 1 5 2 3 5 11"

32 8 3 32 8 32 8 32 32 8 32 8 32 32

*fff*

a

b

c

x

ped

3 2 5 1 5 2 3 1 3 5 1 5 2 3 5 11"

32 8 3 32 8 32 8 32 32 8 32 8 32 32

3 ob

mst

*sfz*

3 ob

mst

*sfz*

3 ob

mst

*sfz*

8

27

11" 3  
32

*p* *ff* *p* *ff* *fff* *p*

*sff*

( 1.v. )

b a  
c  
x  
ped

11" 3  
32



3 2 2 3 9 2 7 1 3  
32 4 32 4 32 4 32 4 32

*pp*

*ppp*

*ppp*

ped

X

b a c

3 2 2 3 9 2 7 1 3  
32 4 32 4 32 4 32 4 32

*sf*

*mp*

one hair

Musical score for a piano piece, consisting of three systems of staves. The score is divided into measures by vertical bar lines.

**System 1 (Top):**

- Staff 1: Piano part with dynamics *pp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 2: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 3: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 4: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

**System 2 (Middle):**

- Staff 5: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 6: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 7: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 8: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

**System 3 (Bottom):**

- Staff 9: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 10: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 11: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
- Staff 12: Piano part with dynamics *ppp*. Measures 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

Performance instructions include "one click" and "l.v." (lento vivace). Dynamics range from *ppp* to *p*. The score includes various musical notations such as notes, rests, and articulation marks.

2 4 2 8 4 8 4 32

highest note

< f > sfz

sfz p ppp

highest note

< f > sfz

p pp

teeth on reed

< f > sfz

teeth on reed

< f > sfz

< sfpp sfpp 3 sim.

with smooth edge

sffz

3

1.v.

b a c x | ped

2 4 2 8 4 8 4 32

pizz

IV I

I/II

sffz sffz

f 3 sf pp

pizz

IV I

I/II

sffz sffz

f 3 sf pp

pizz

IV I

I/II

sffz sffz

f 3 sf pp

31

4 2 4 3 3 4 3

32 4 32 4 32 32 32 32

*pp* *p* *p* *p* *p* *mp* *p* *mp*

*pp* *pp* *p* *p* *mp* *p* *mp*

*pp* *pp* *pp* *pp* *pp* *pp* *pp* *pp*

*pp* *pp* *pp* *pp* *pp* *pp* *pp* *pp*

*ppp*

1.v. 1.v. 1.v. 1.v.

b a c x |

ped

4 2 4 3 3 4 3

32 4 32 4 32 32 32 32

*pp* *p* *ppp* *p* *mp* *ppp* *mp* *f* *mp*

*pp* *p* *p* *p* *mp* *ppp* *mp* *f* *mp*

*pp* *p* *p* *p* *mp* *ppp* *mp* *f* *mp*

IV IV IV III 5

III 5 5

5 5

32

3 3 3 2

32 2 32 2 3 32

*ppp*

air tone, with slight pitch

*p*

as before

*p*

3

3

*ppp*

3

*p*

*ppp*

subito

*ppp*

1.v.

*sff*

1.v.

b a c

x

ped

3 3 3 2

32 2 32 2 3 32

on the verge of pitch

*pp*

III IV

*mp*

*pp*

on the verge of pitch

(senza vibr.)

*pp*

III II

III II

3

*p*

33

10''

3 5 5 2 3  
32 8 32 8 2

*mf* *mp* *pp*

as before

*p* *mp* *pp* *mf*

*p* *mp* *pp* *cresc.* *mp*

*ppp* *ppp* *mf*

7 7 1.v. 7 7

1.v.

piano *p*

ped

10''

3 5 5 2 3  
32 8 32 8 2

*mp* *mp* *pp* *mf*

8va

*pp* *mp* *pp* *mf*

*mp* *sfpp* *mf*

senza a molto vibrato (non harmonic)

senza a molto vibrato (non harmonic)

senza a molto vibrato (non harmonic)

34

10"

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*.

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*.

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*.

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*. The dynamic changes from *fff* to *dim.* to *pp* to *sfff*.

cymbal  
 ♯  
 ○  
*p sempre*  
 (brush)

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*. The dynamic changes from *fff* to *dim.* to *pp* to *sfff*.

10"

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*. The dynamic changes from *sfff* to *mf*.

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*. The dynamic changes from *sfff* to *mf*.

Musical staff with notes and dynamics. The notes are marked with accents (>) and the dynamic is *sfff*. The dynamic changes from *sfff* to *mf*.

35

10"

This system contains four staves of musical notation. The first three staves feature rhythmic notation with stems and flags, accompanied by dynamic markings of *mp* and *f*. The fourth staff contains a large graphic notation section with dense horizontal lines and vertical strokes. Below the staves, there are additional markings including *dd*, a series of vertical bars, and a section labeled *ped* with a dotted line.

10"

This system contains three staves of musical notation. The first staff includes the instruction "extreme vibr." and dynamic markings of *sf*, *p*, and *sfz*. The second and third staves feature performance instructions such as "jete" and "I/II" along with various dynamic markings. A box containing the number "36" is located at the bottom left of the system.



10"

Musical score for piano, consisting of five staves. The first four staves contain melodic lines with various articulations and dynamics. The fifth staff is a grand staff for the lower register, including a bass clef staff and a piano pedal (ped) line. Dynamics include *pp*, *mp*, and *f*. The score includes a variety of rhythmic patterns and textures.

10"

Musical score for piano, consisting of three staves. The first staff features a series of chords with dynamic markings *sf* and *p*, and includes performance instructions like *I/II*, *jete*, *ob*, *mst*, and *msp*. The second and third staves contain melodic lines with dynamics *p*, *sfp*, *sf*, and *sfz*. The score includes various articulations and dynamic markings.

37

10" 6 4

pp

b a c  
x  
ped

10" 6 4

sf sf p sfp mp

sf sf sf sf sf sf sf p sfp mp

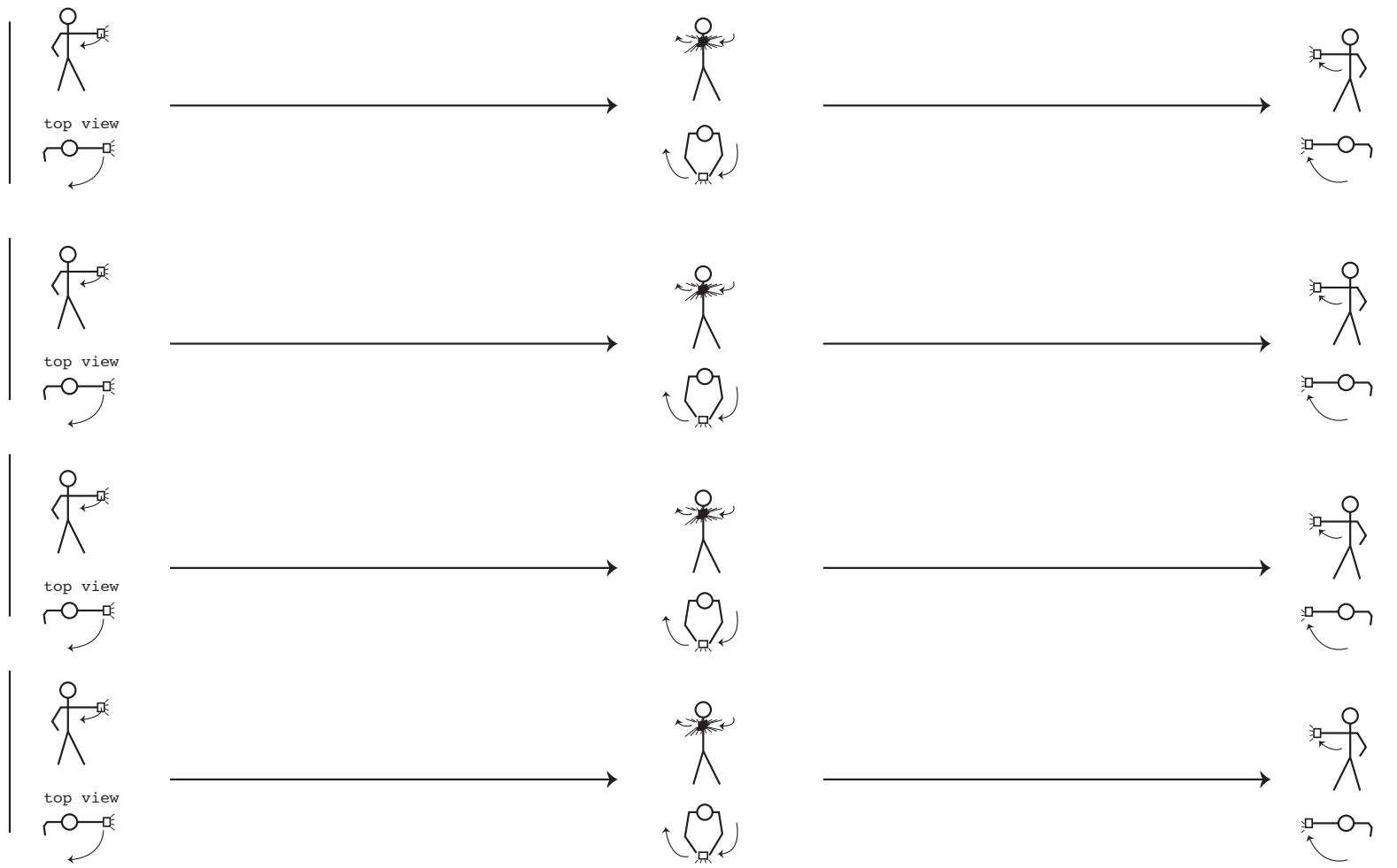
sf sf sim. p sfp mp

38



white noise in speakers  
 mute direct signal for piano (keep mics)

11"

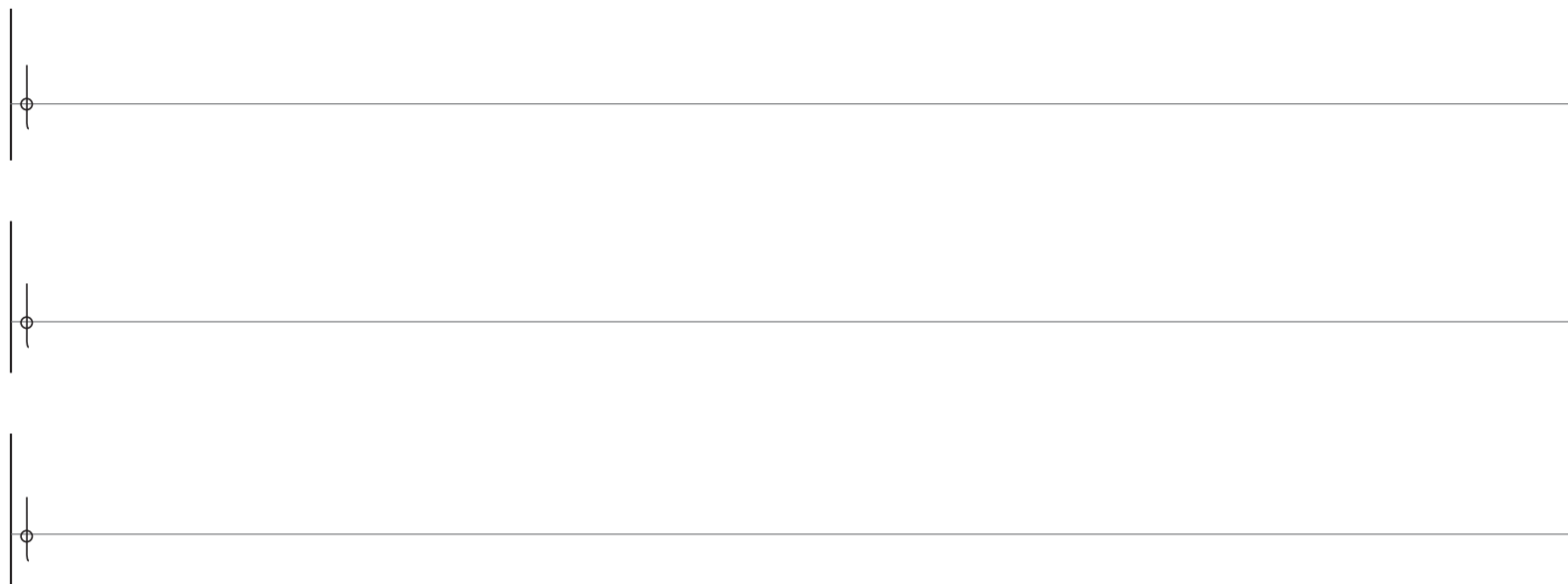


conductor and the rest of the ensemble freeze

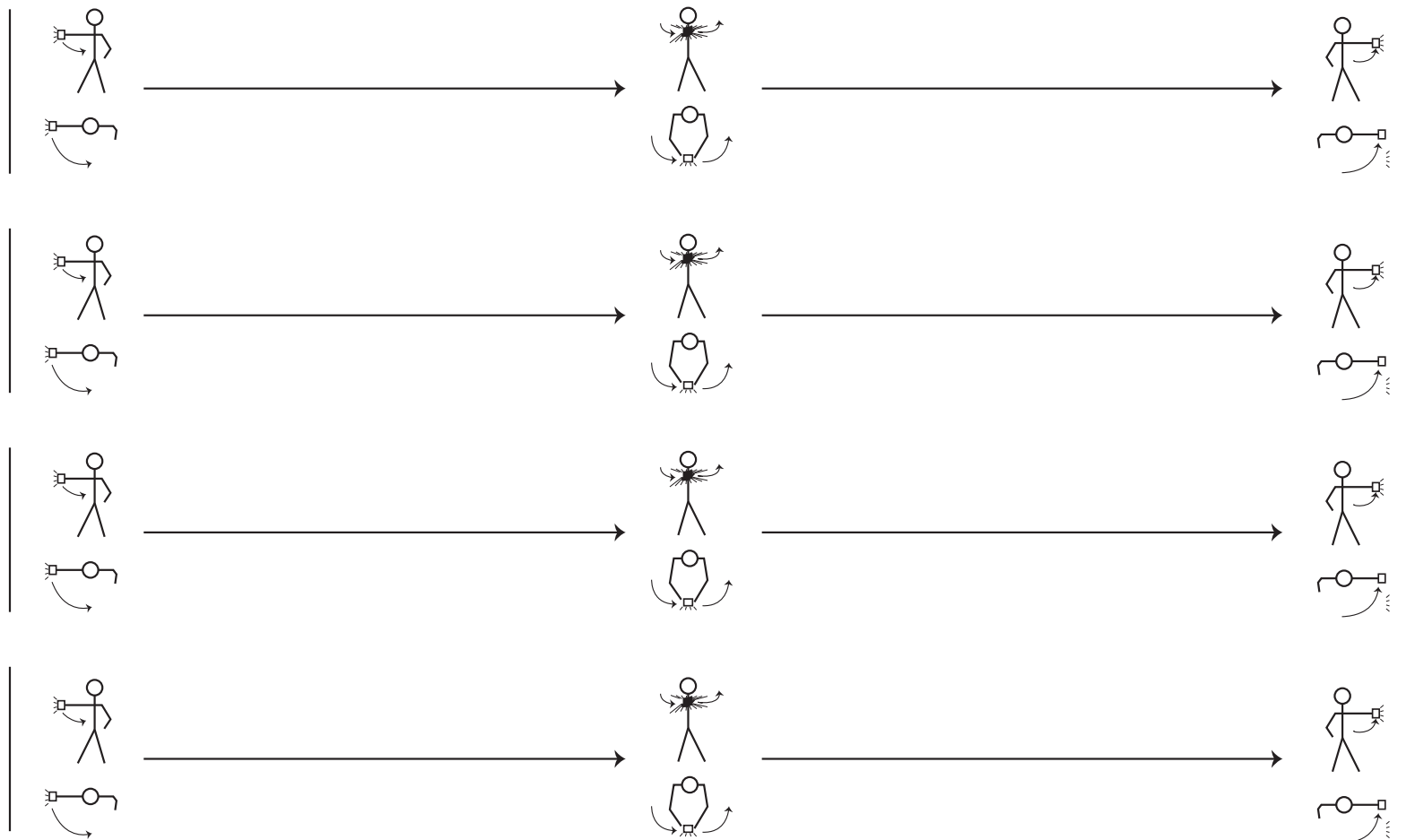
wacom instrument controls filtered white noise, follow gestures of winds with noise gesture

b  
a  
c  
x  
ped

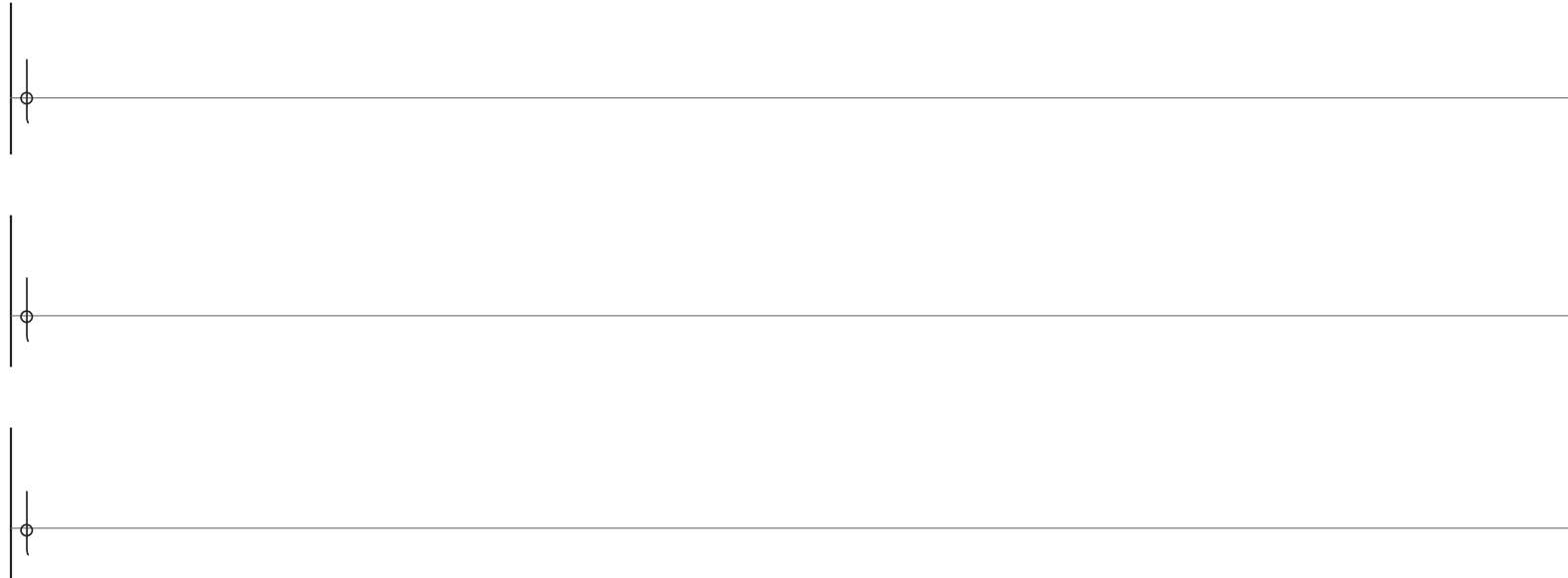
11"

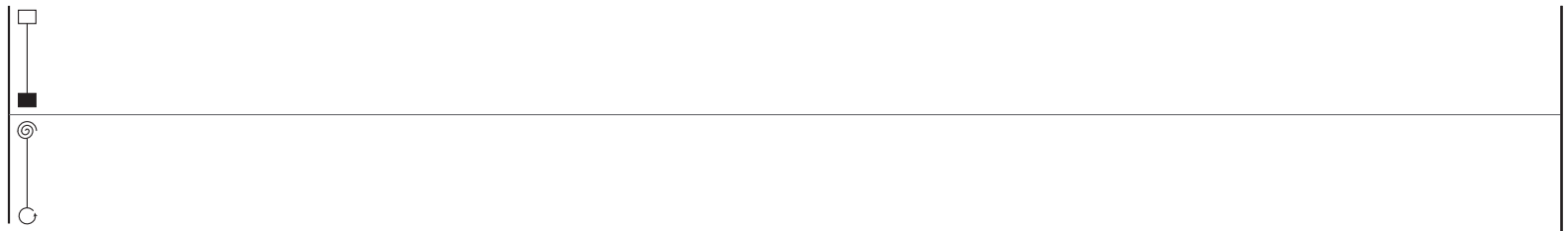
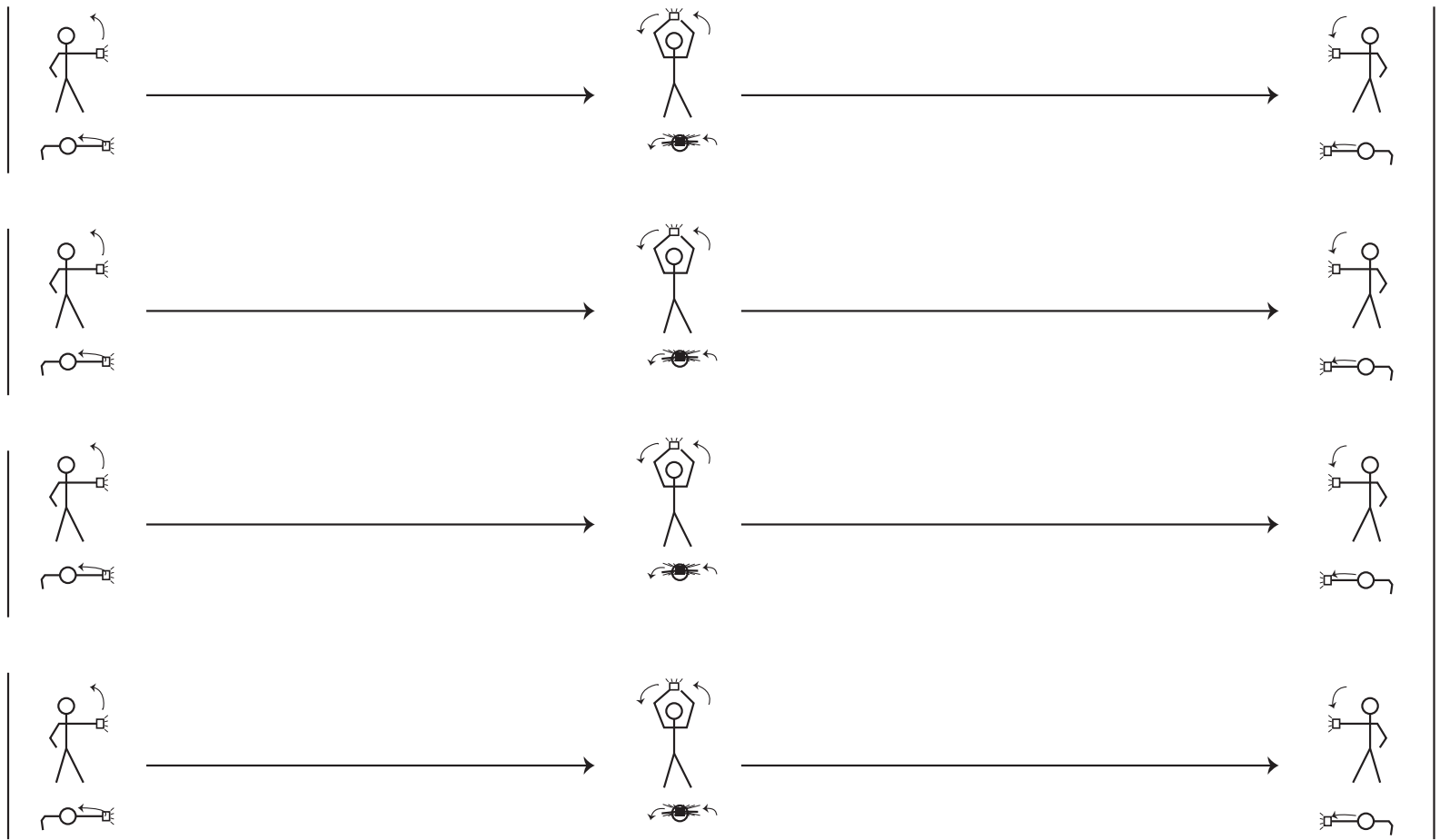


40



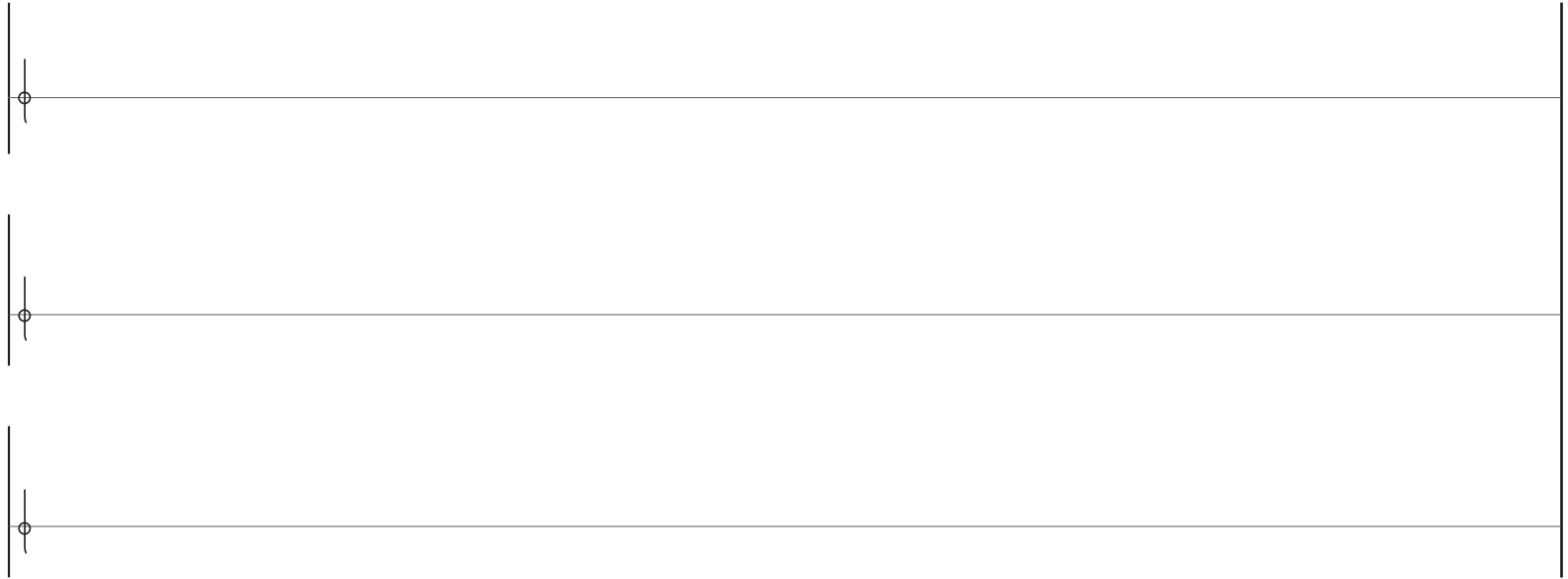
b<sup>a</sup>  
c  
x  
ped



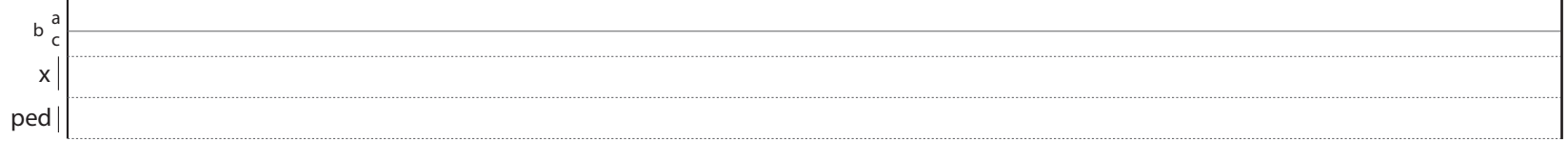
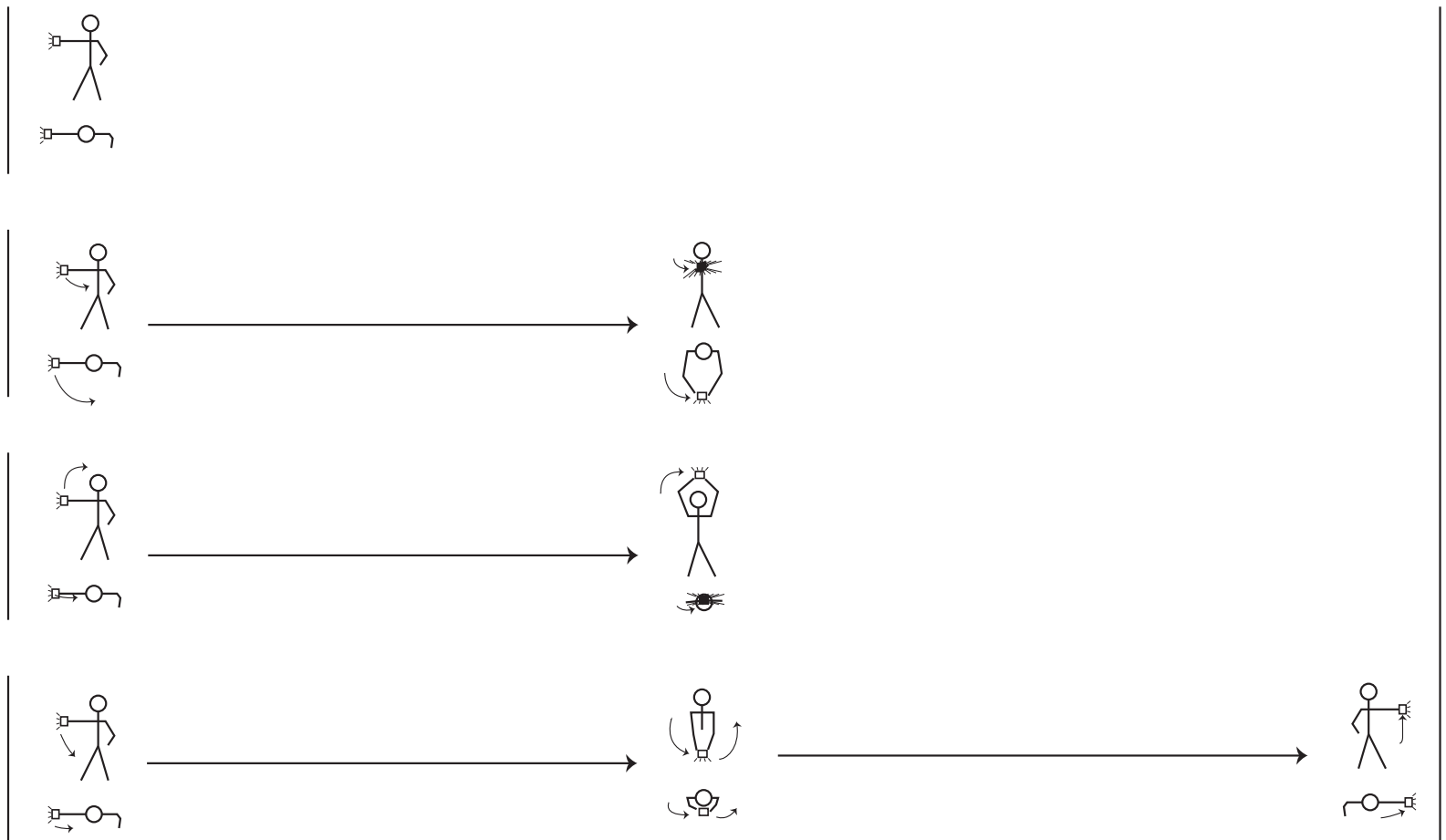


b<sup>a</sup>  
c  
x  
ped

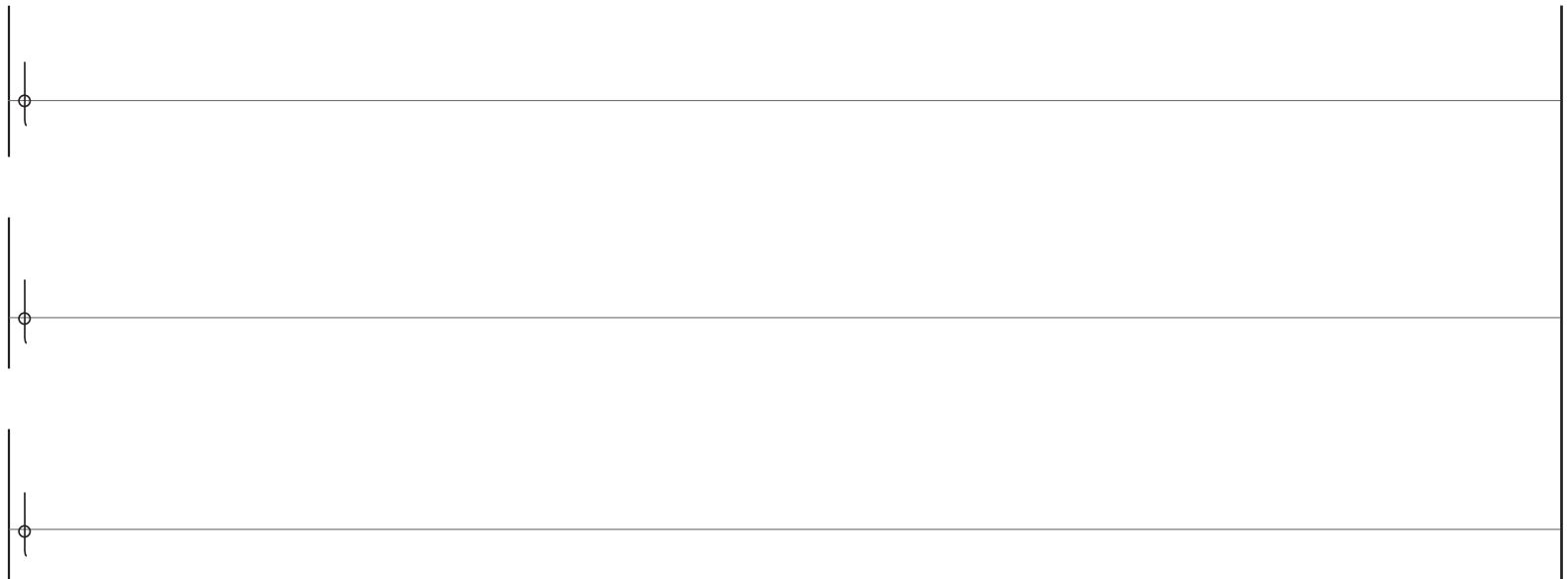
10"



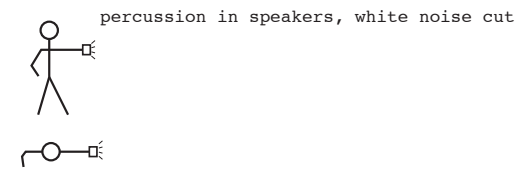
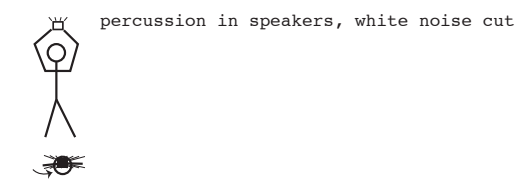
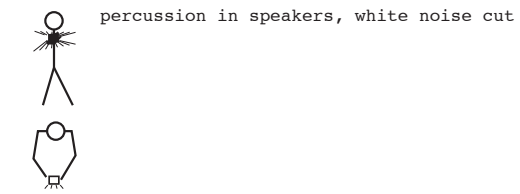
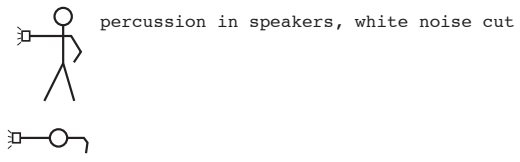
42



10"



43



pp

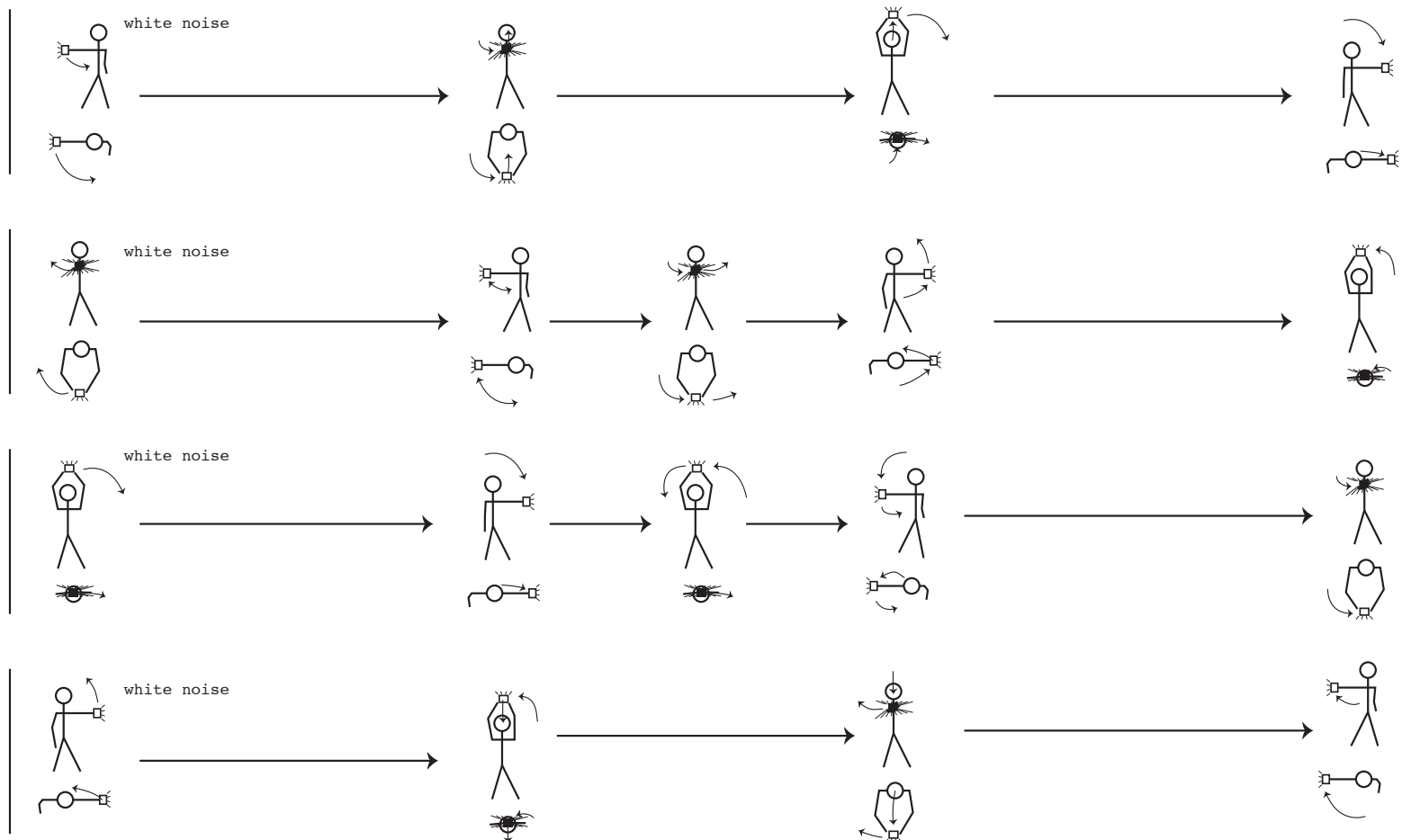


(sound is in handheld speakers)

9

44



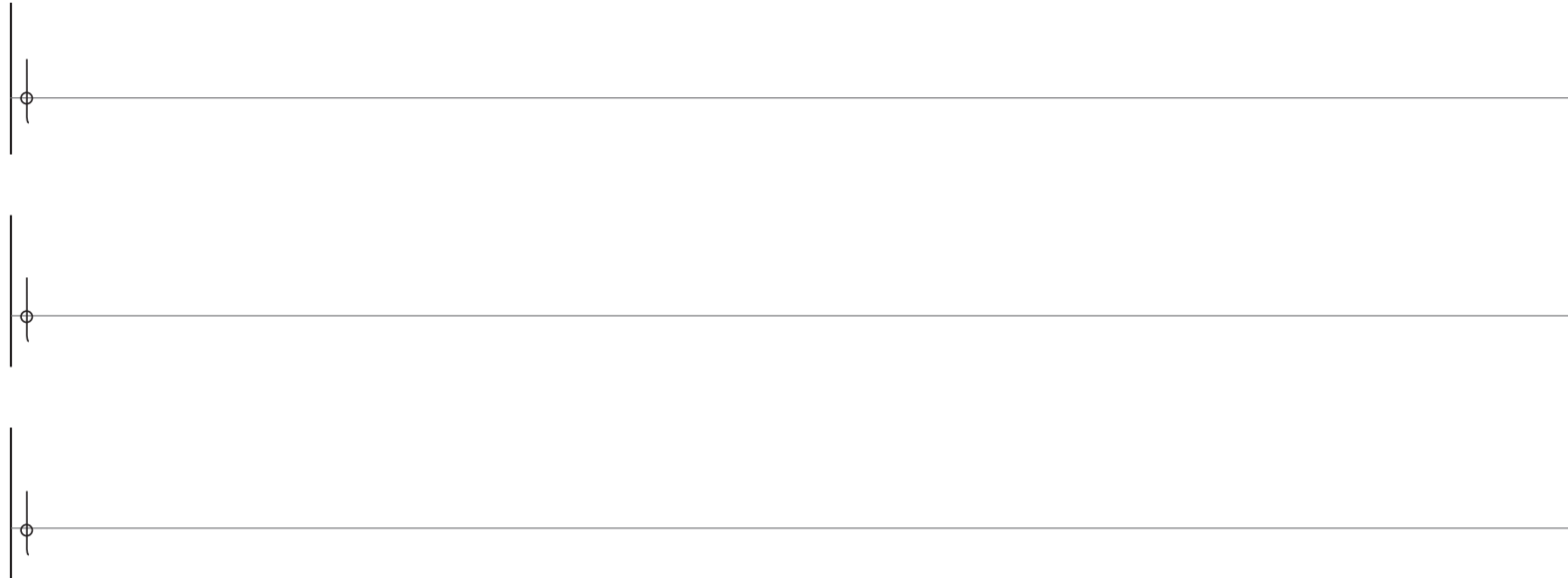


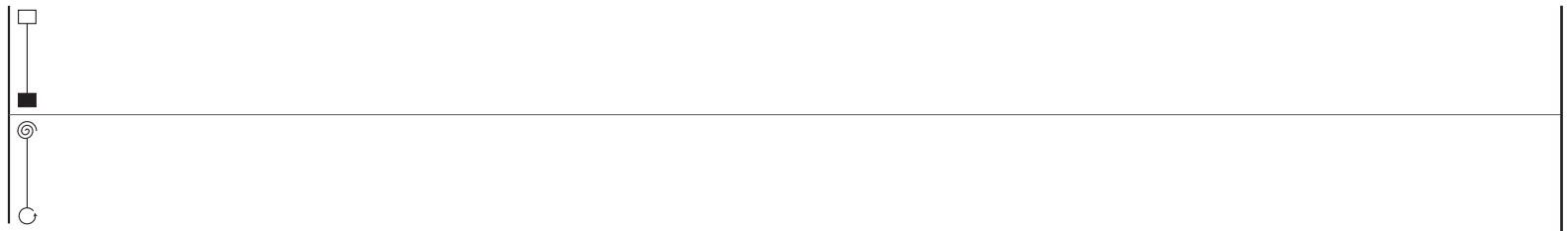
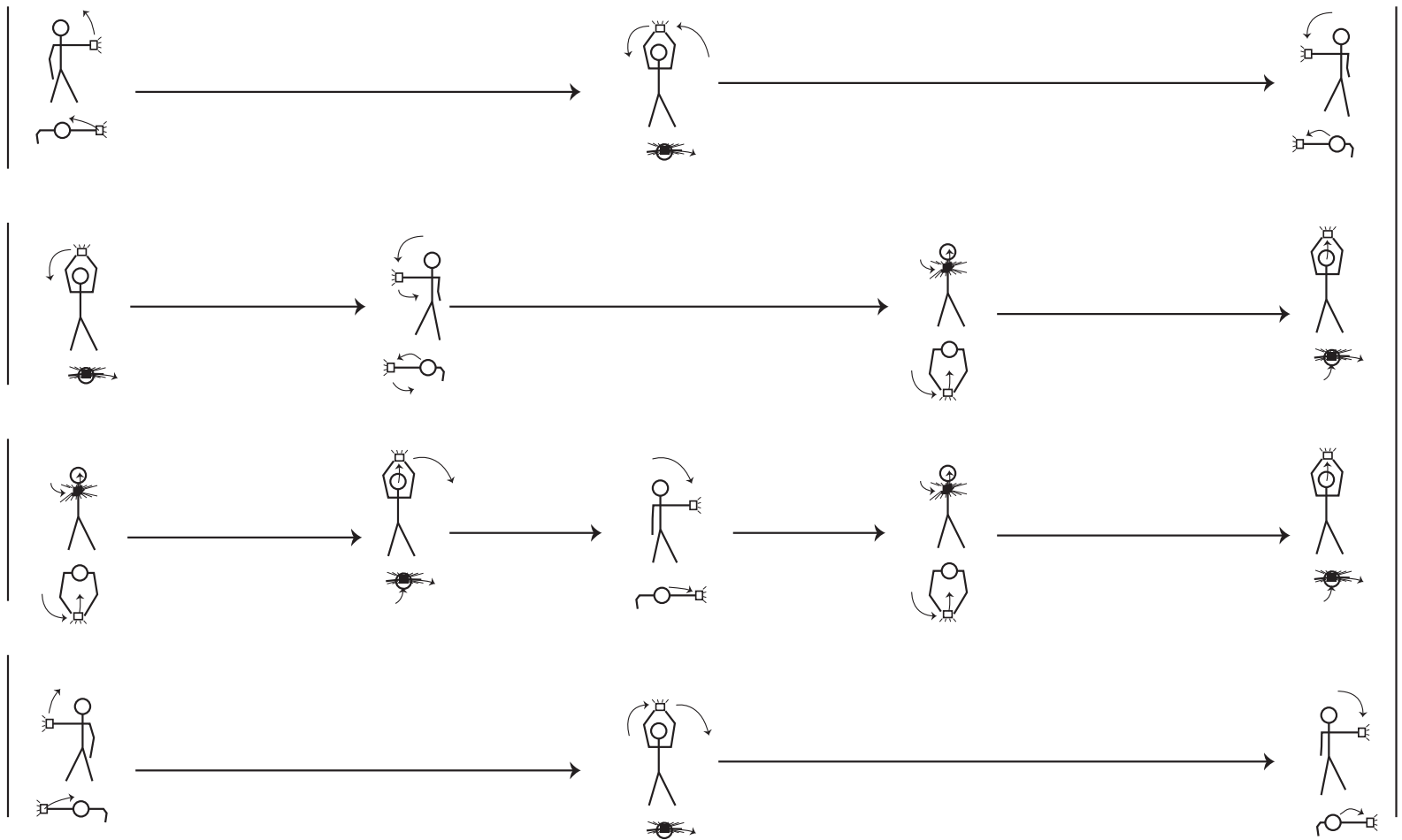
10

b a  
c

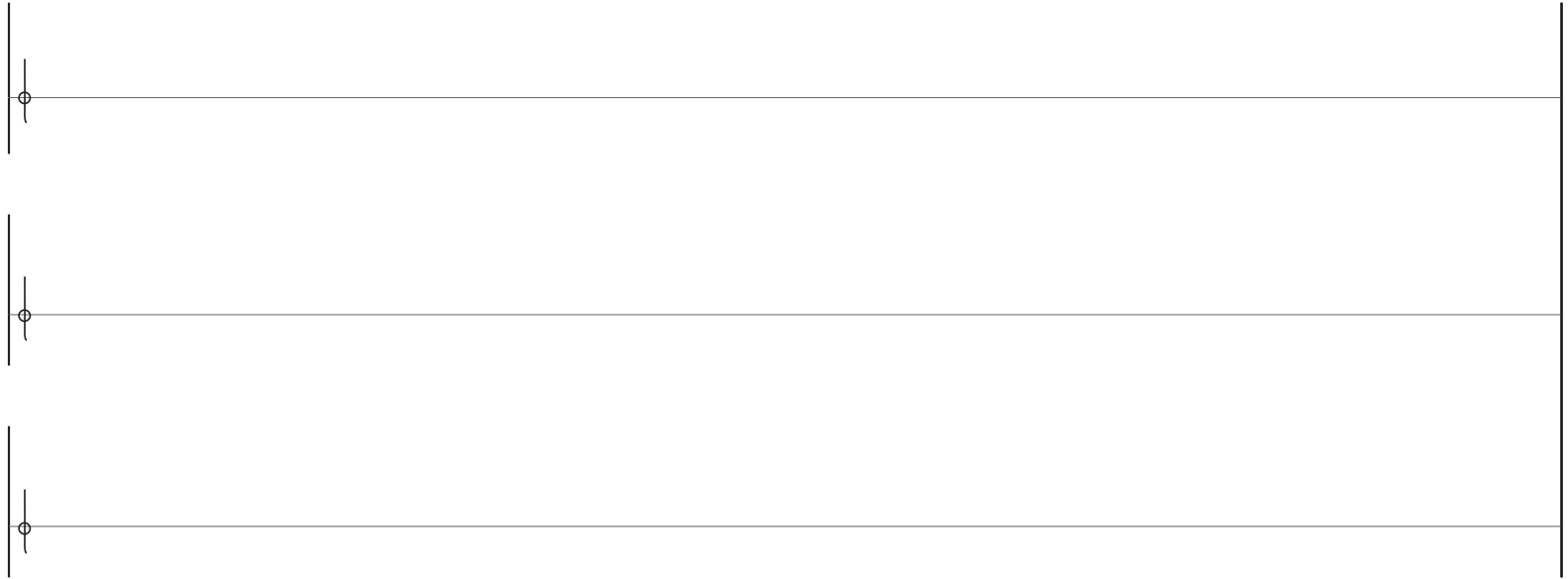
x

ped

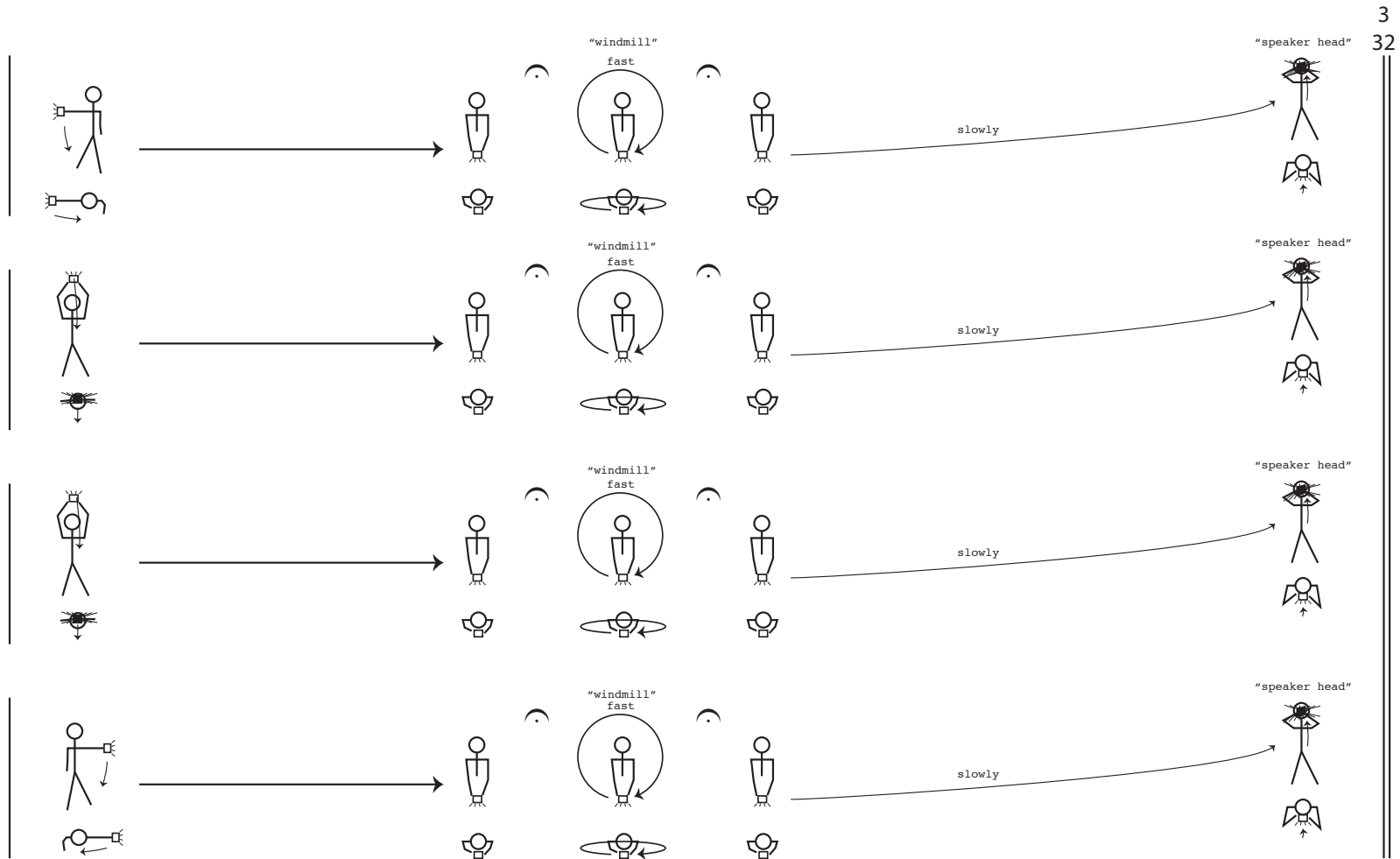




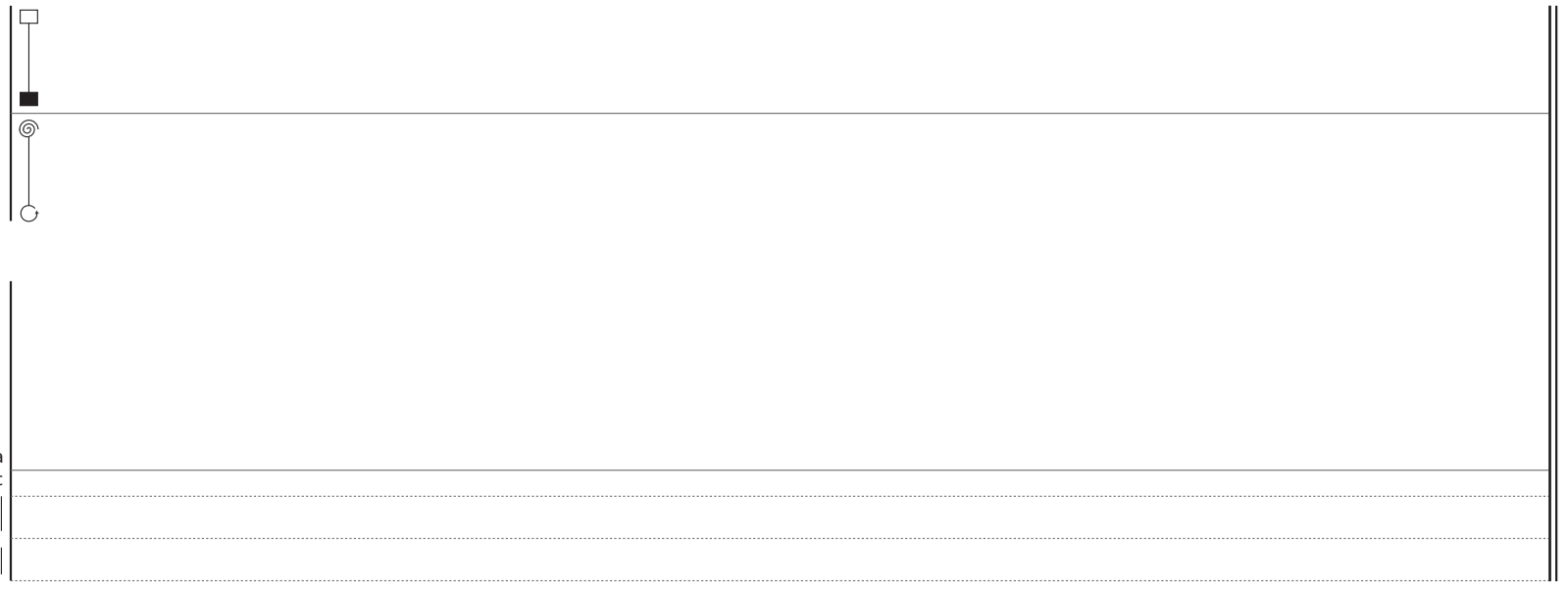
b a  
c  
x  
ped



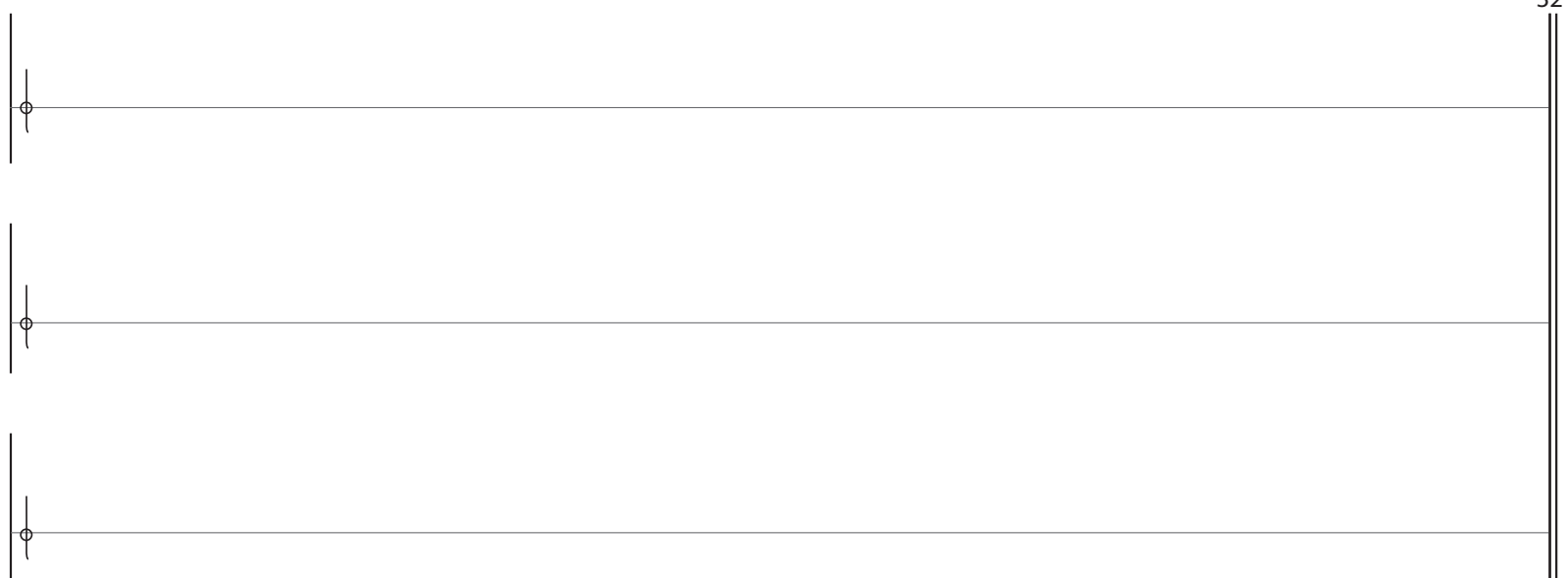
cue



3  
32



3  
32



47

3 2  
32 4

percussion only

percussion only

percussion only

percussion only

2 3  
32 4

random turn +/- 45 deg.

random turn +/- 45 deg.

random turn +/- 45 deg.

random turn +/- 45 deg.

9 2  
32 4

random turn +/- 45 deg.

random turn +/- 45 deg.

random turn +/- 45 deg.

random turn +/- 45 deg.

7 1 3  
32 4 32

random turn +/- 45 deg.

random turn +/- 45 deg.

random turn +/- 45 deg.

random turn +/- 45 deg.

percussion in small speakers

b a c  
x |  
ped |

with mutes?

3 2  
32 4

I/II

"sf"

clb  
8

mp

one hair  
I

2 3  
32 4

clb  
8

9 2  
32 4

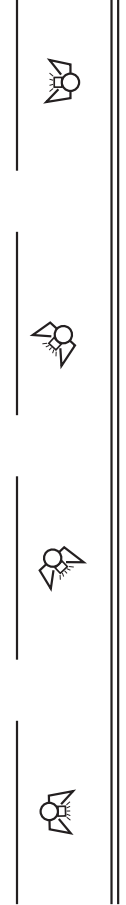
clb  
8

7 1 3  
32 4 32

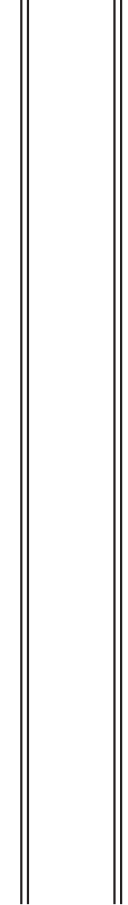
electronics: resonate from short scurries

The score is organized into three systems, each with three measures. The first system consists of measures 32-33 (3/8), 34-35 (6/8), and 36-37 (2/2). The second system consists of measures 38-39 (3/32), 40-41 (4/8), and 42-33 (3/32). The third system consists of measures 44-45 (3/32), 46-47 (6/8), and 48-49 (2/2). The score includes electronic notation (vertical lines, scribbles, 'l.v.'), oboe notation (melody, dynamics like ppp, and articulation like 'one click'), and a pedal line with notes and rests.

3 14"  
32



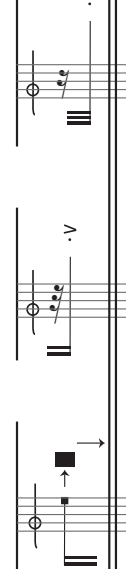
4 7"  
32



3  
32

recording of a large group of people talking filtered with wacom interface and played into transducers into the piano

3 14"  
32



4 7"  
32



3  
32

50

3  
32

3  
2

3  
32

3  
4

3  
32

13

a  
b  
c  
x  
ped

3  
32

3  
2

3  
32

3  
4

3  
32

mute string with bow

*sfz* "fff"

*sfz ppp* < *p* >

*sfz ppp* < *p* >

*sfz* "fff"

*sfz ppp* < *p* >

*sfz* "fff"

*sfz ppp* < *p* >

*sfz* "fff"

*sfz ppp* < *p* >

*sfz* "fff"

mst

ob

51





2 4 2 8 8 3 4

beep! \*

beep! \*

beep! \*

beep! \*

with smooth edge

14

b a c x | ped

2 4 2 8 8 3 4

pizz

IV I

sffz sffz

f 3 sf pp

pizz

IV I

sffz sffz

f 3 sf pp

pizz

IV I

sffz sffz

f 3 sf pp

p

p

p

53

3 5 5 6 3 7 5 5"

4 16 4 16 4 16 4

rocks

finger tip

crush

*pp*

*p*

*pp*

b  
a  
c

x

ped

3 5 5 6 3 7 5 5"

4 16 4 16 4 16 4

*mp* *pp* *mp* *pp* *p* *mp* *pp* *mp*

*mp* *pp* *mp* *pp* *p* *mp* *pp* *mp*

*mp* *pp* *mp* *pp* *p* *pp* *pp* *mp*

ob

mst

jeté

I II III

5"

3  
32

Handwritten musical score for a string instrument. The score is written on a staff with a treble clef, a key signature of one sharp (F#), and a 3/32 time signature. The notation includes a melodic line with various articulations, a series of bowing diagrams, and a pedal point section. The bowing diagrams show the bow's position and movement across the string. The pedal section is marked 'ped' and shows a sustained note with various bowing techniques.

5"

3  
32

bow just on the boarder of pitch  
senza vibr.

*pp*

bow just on the boarder of pitch  
senza vibr.

*pp*

bow just on the boarder of pitch

*pp*

Handwritten musical score for a string instrument, featuring a staff with a treble clef, a key signature of one sharp (F#), and a 3/32 time signature. The score includes three staves of notation, each with a melodic line and a key signature of one sharp (F#). The first two staves are marked *pp* and include the instruction "bow just on the boarder of pitch senza vibr.". The third staff is also marked *pp* and includes the instruction "bow just on the boarder of pitch".

55

3 3  
32 2

3 2  
32 2

4  
32

subito  
pizz  
pizz II  
sffz  
poco a poco vibrato  
1.v.  
sff

3 3 3 2  
32 pizz II 2

poco a poco vibrato

molto vibrato

3 2  
32 I 2

sffz

poco a poco vibrato

molto vibrato

sffz

3 2  
32 I 2

sffz

56

4 2 4 3 3 4 5  
32 4 32 4 32 32 8

1.v.  
ped

ppp

4 2 4 3 3 4 5  
32 4 32 4 32 32 5 8

pp p ppp p mp ppp mp "fff" mp "fff" mp "fff"

57

5 5 2 3  
8 32 8 2

10"

The first system of the score consists of two parts. The lower part is a piano score on a grand staff (treble and bass clefs). It begins with a glissando marked 'col lengo glissando' and 'l.v.' (lento vivace). The piano part includes a dynamic marking 'p' (piano) and a 'ped' (pedal) symbol. The upper part is a graphic notation consisting of a wavy line that starts at a 'ppp' (pianissimo) dynamic and gradually increases to 'mf' (mezzo-forte). Vertical lines separate the measures, with fingerings 5/8, 5/32, 2/8, and 3/2 indicated above them.

5 5 2 3  
8 32 8 2

10"

col lengo glissando

col lengo glissando

col lengo glissando

58

The second system of the score consists of three piano staves and a graphic notation part. Each piano staff begins with a glissando marked 'col lengo glissando'. The graphic notation part features a wavy line that starts at a 'p' (piano) dynamic and gradually increases to 'mf' (mezzo-forte). Vertical lines separate the measures, with fingerings 5/8, 5/32, 2/8, and 3/2 indicated above them. A box containing the number '58' is located at the bottom left of the system.

10"



wacom + percussion in speakers



wacom + percussion in speakers



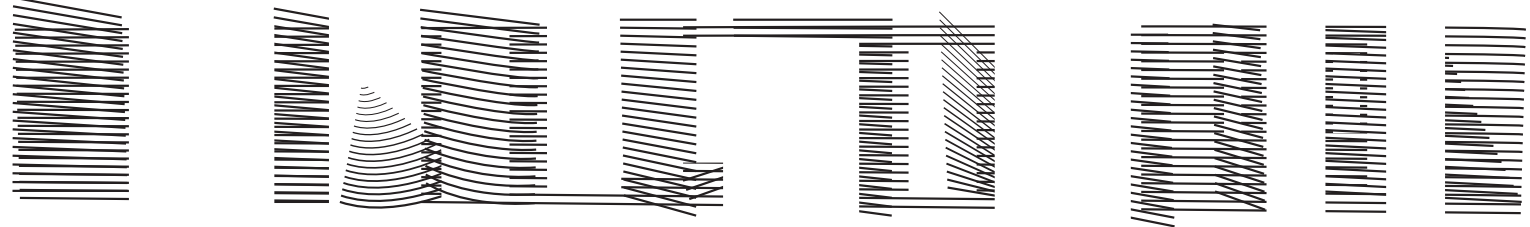
wacom + percussion in speakers



wacom + percussion in speakers



unconducted unison with piano



15

b

a

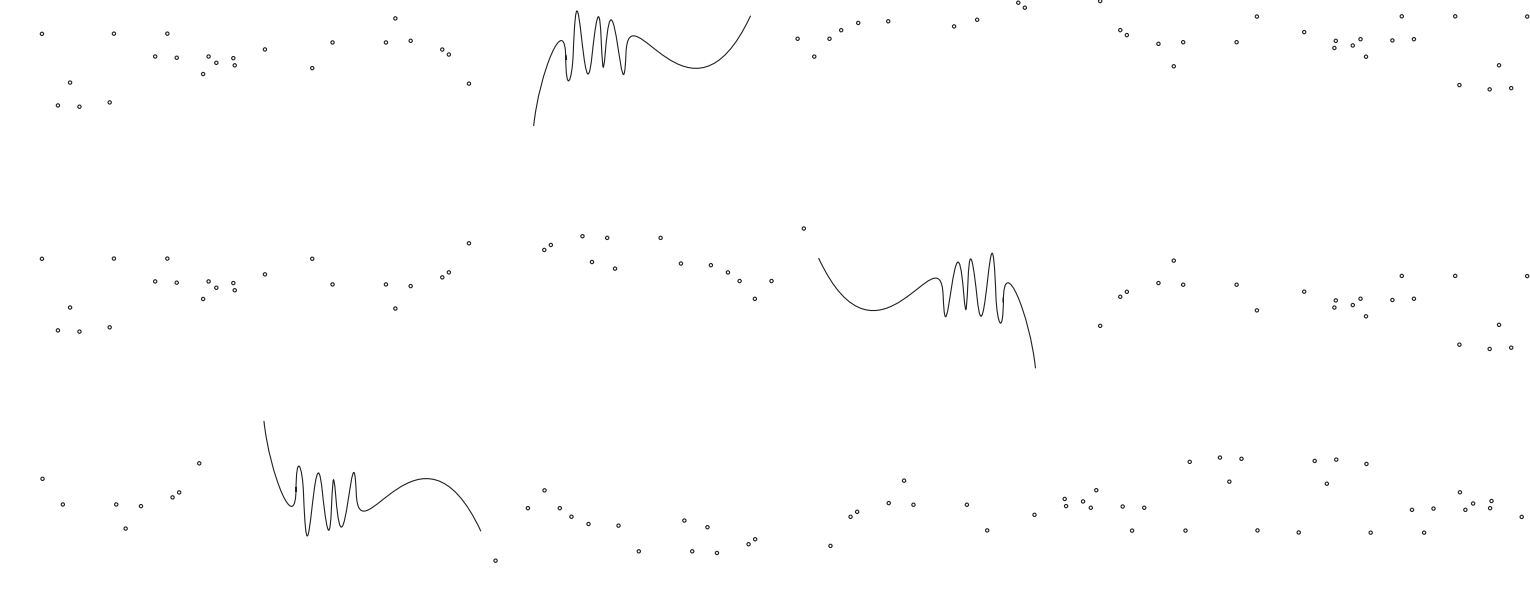
c

x

ped

unconducted unison with percussion

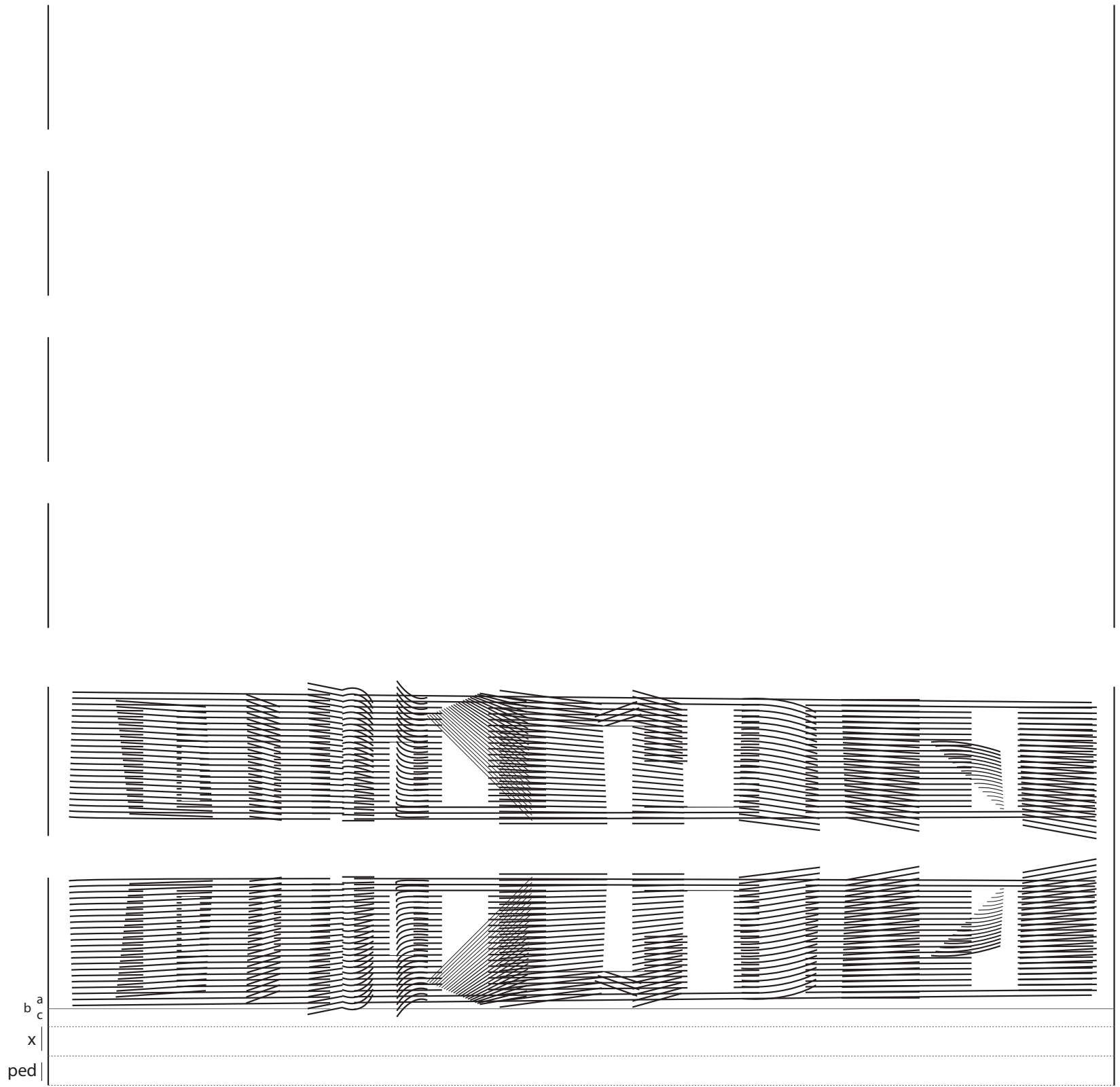
10"



59

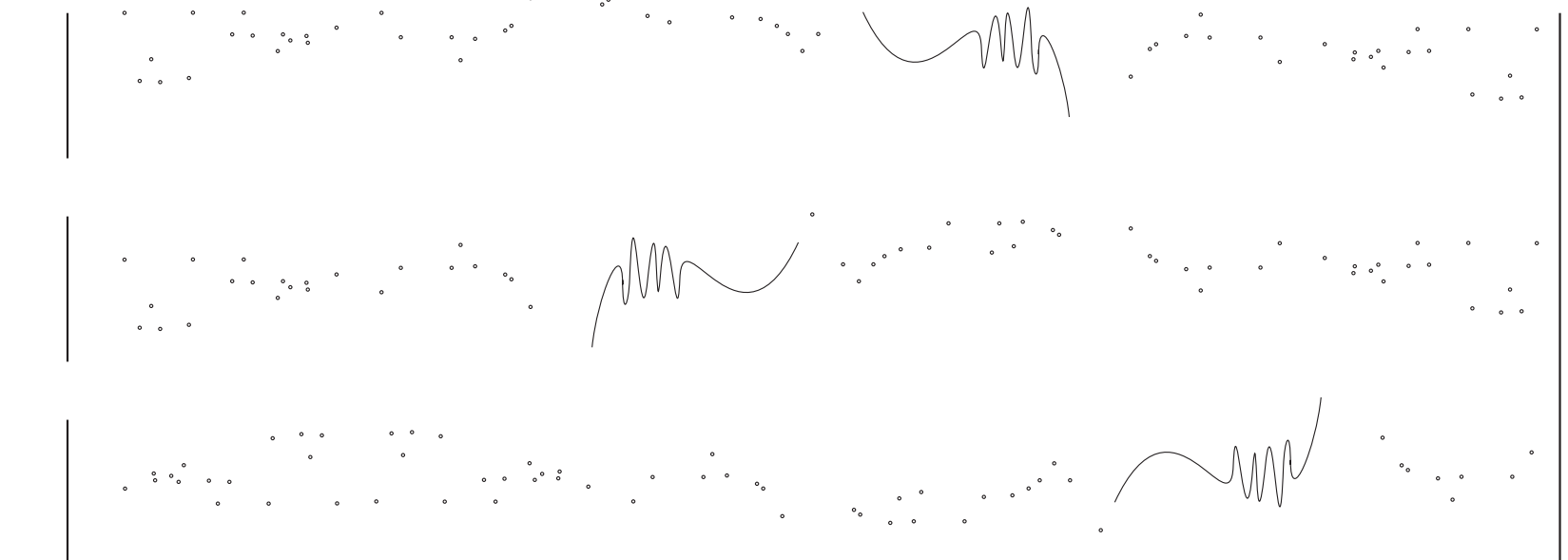
10"

7"



10"

7"



60



7"

10"

(end unison)

cymbal

$\text{c}$   
o  
*pp*



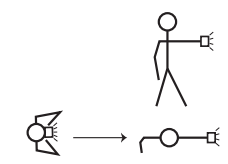
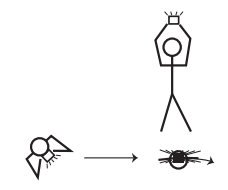
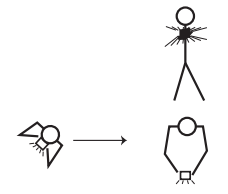
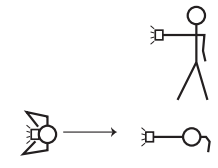
b  
a  
c  
x  
ped

7"

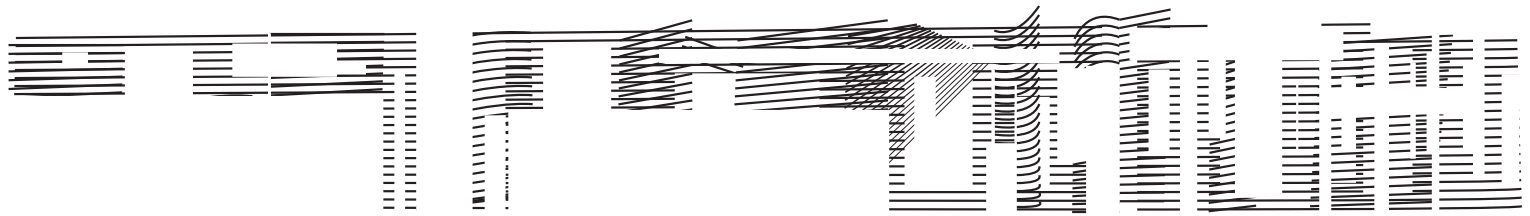
10"

61

10"



pp



b a c

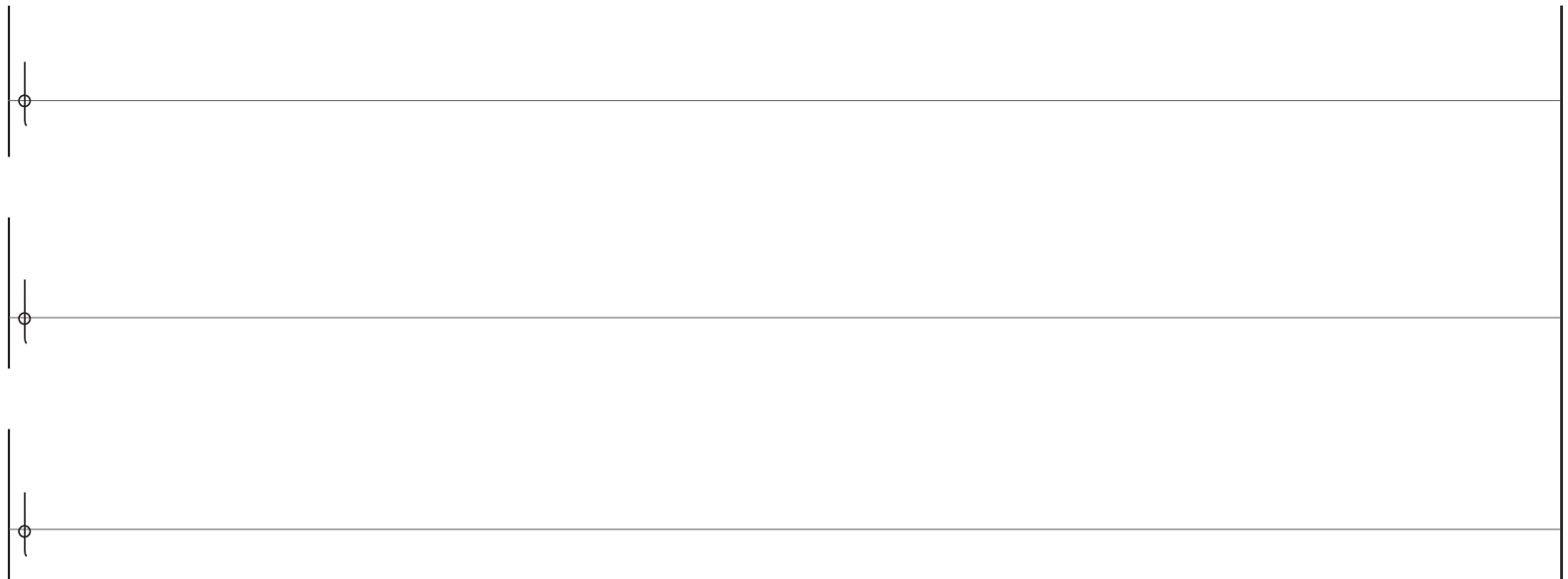
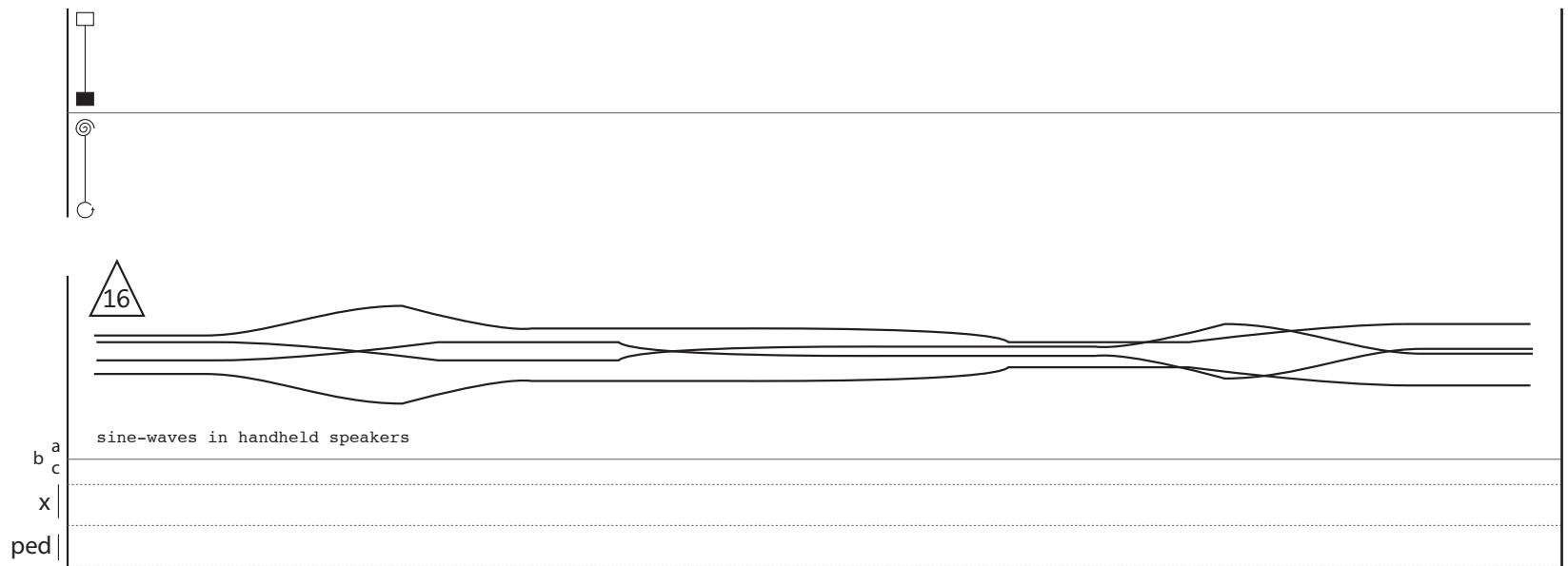
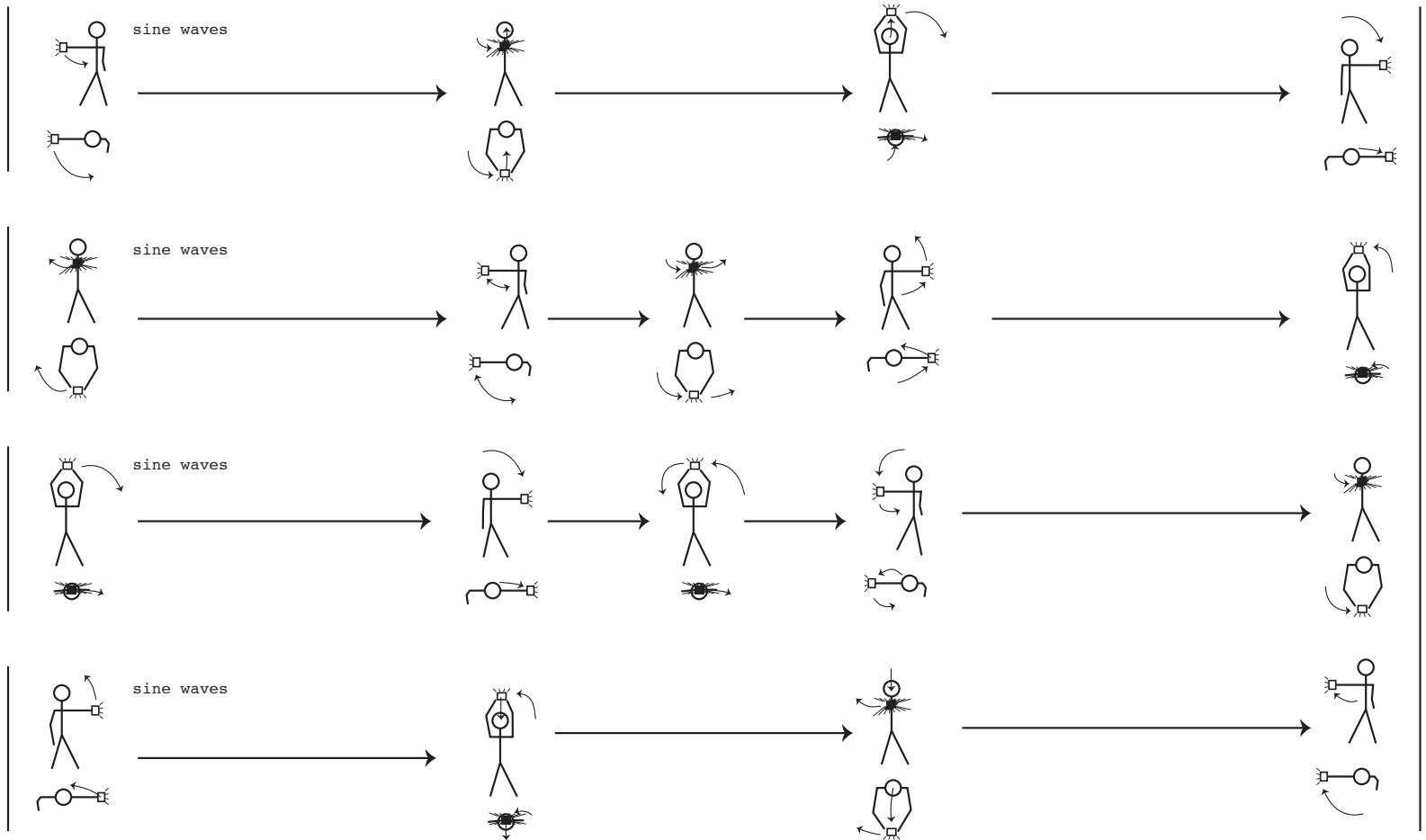
x

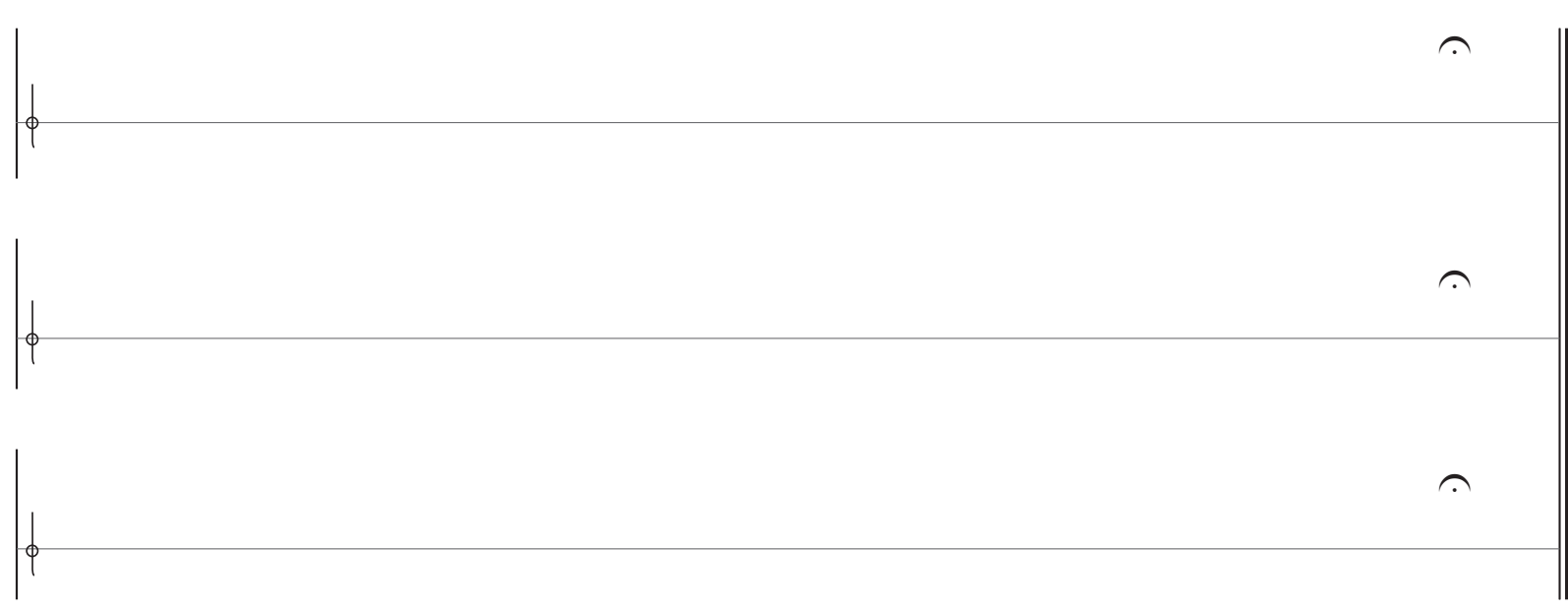
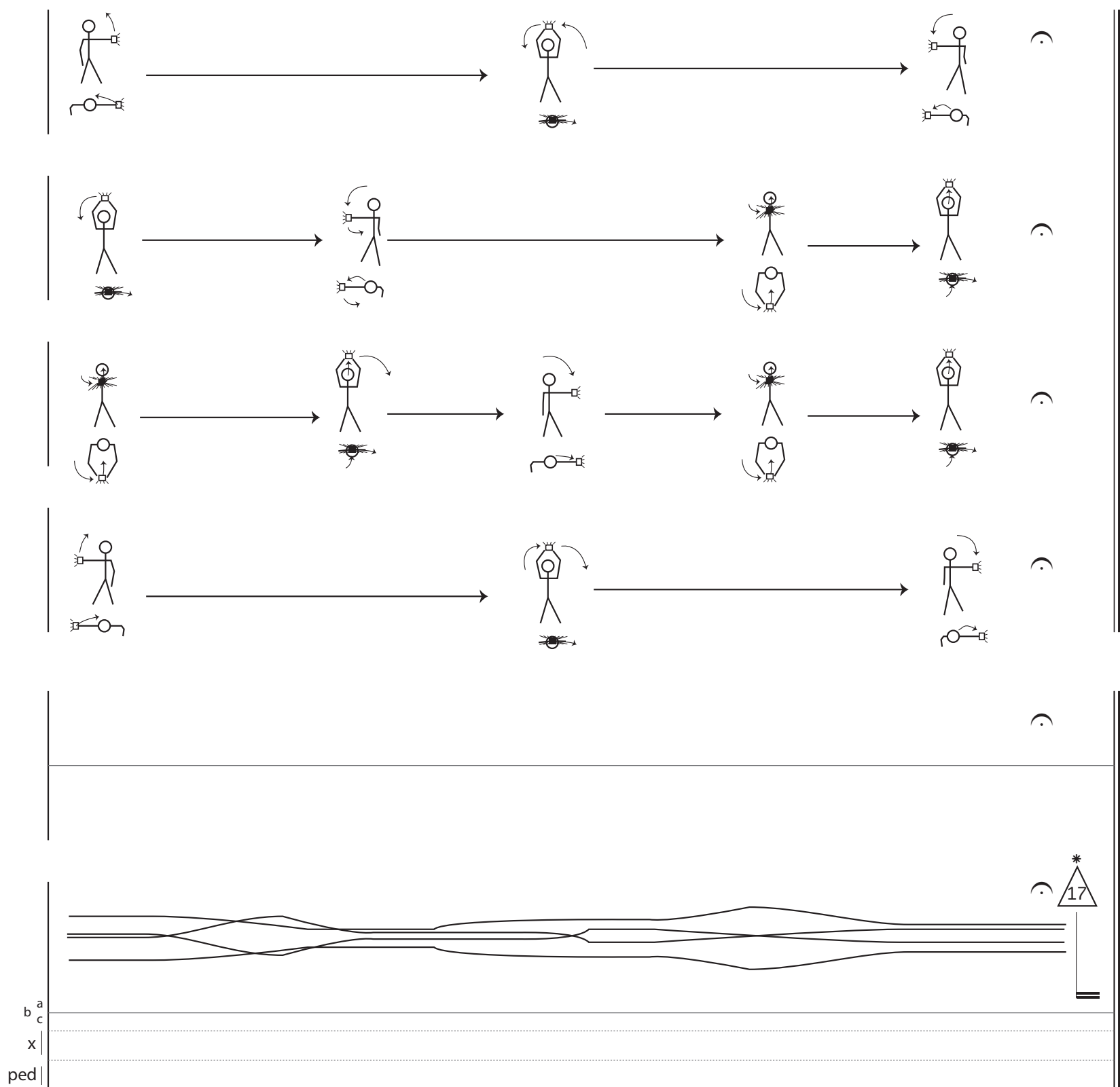
ped

10"



62





oct. 6, 2014, Berkeley