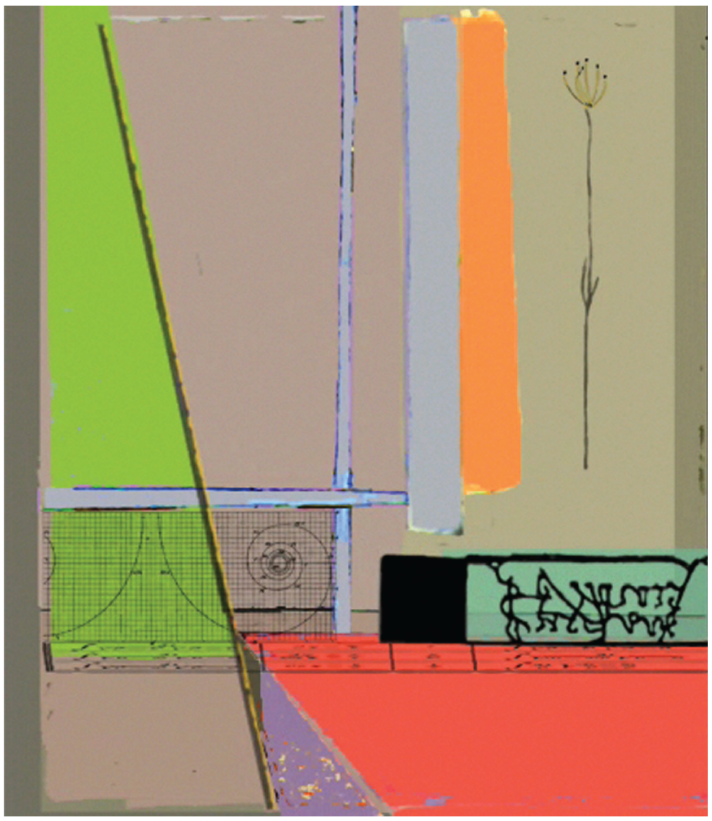
~ *bitKlavier* ~

Mikroetudes

for Prepared Digital Piano



edited by

Dan Trueman

~ Many Arrows Music ~

www.manyarrowsmusic.com

~ *bitKlavier* ~

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The *bitKlavier* Series:

Nostalgic Synchronic Mikroetudes

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cover art, by Judy Trueman, from the film *Matisse's Garden Lesson*

Preface to *bitKlavier* and the *Prepared Digital Piano*

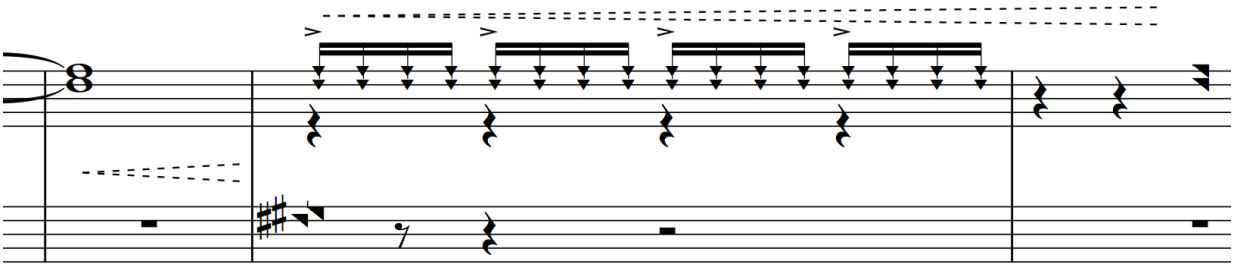
Like the prepared piano, the prepared *digital* piano feels just like a piano under the hands and often sounds like one, but it is full of surprises; instead of bolts and screws stuck between the piano strings, virtual machines of various sorts adorn the virtual strings of the digital piano, transforming it into an instrument that pushes back, sometimes like a metronome, other times like a recording played backwards. The virtual strings also tighten and loosen on the fly, dynamically tuning in response to what is played.

I have long been interested in the differences between mechanical time and how we actually feel and articulate time as biological creatures. This goes back to my experiences—shared by many!—practicing with a metronome, and has continued through my recent piece *neither Anvil nor Pulley,* commissioned by So Percussion. Directly inspired by an instrument created for *neither Anvil nor Pulley*, the prepared digital piano is driven by *bitKlavier,* the most recent software instrument I have built to explore these ideas. One thing I am particularly excited about here is how *accessible* the technology is; all the player needs is a standard 88-key MIDI keyboard and a laptop (or even an iPad).

Comprehensive technical notes about the instrument are included at the end of this volume and with the software itself, but for purposes of understanding the pieces and notation, I will summarize here. There are four main sorts of preparations: *synchronic*, *nostalgic*, *tuning*, and *direct*. The **synchronic** preparations create pulses based on the notes played; these pulses may be metronomic or more complex, depending on how the preparation is configured. At its core, the synchronic preparation is a kind of *resettable metronome* (which, rather than clicking like a metronome, plays piano sounds) where the player can reset the start time for the metronome by simply playing the instrument; it is in part my revenge again the metronome. The **nostalgic** preparations create reversed piano sounds, again based on the notes played; these reverse piano strikes may synchronize with the synchronic pulses or be based on the length of the notes played, and they may feature *undertow*, where, after reaching a peak, the piano sound then

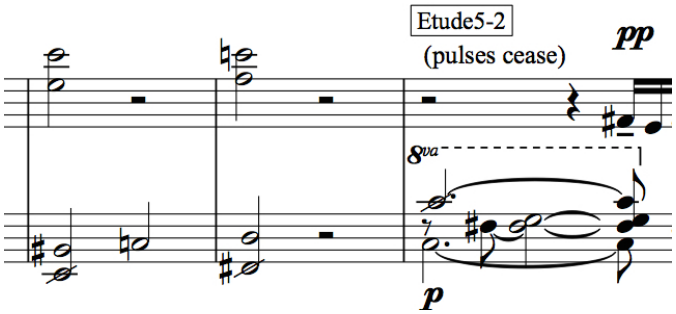
reverses direction, moving forward and fading out. The **tuning** preparations do what you might imagine, changing the tuning in various ways. The **direct** preparations are the simplest and, as of this writing, in part a placeholder for things to come, but at the moment they simply silence particular strings so playing them creates no direct sound (this is inspired in part by Ligeti's Etude #3, *Touches Bloquées*), though other preparations for those notes still activate. All of these preparations are **dynamic** in the sense that they can change as the instrument is played, in a ways impossible with conventional acoustic instruments.

Both the synchronic and nostalgic preparations are usually partially notated in the score, and tuning changes are also sometimes notated. The notation is only partial to avoid clutter; I have attempted to include just enough to be useful to the performer. Synchronic metronome pulses are indicated with downward facing triangles and small note-heads, stemmed opposite to normal notes. Nostalgic swells are indicated with dashed hairpins, cresting/peaking at small angled triangle note-heads:



Synchronic/Nostalgic Preparation Notation.

Sometimes the changeable tuning requires that one note be played ever so slightly before others, triggering the instantaneous tuning change; these notes are indicated with a slash through the note-head:



Tuning Preparation Notation.

Some of the pieces use a single configuration (or preset) of preparations, in which case the player simply selects that preset in *bitKlavier* and plays away. During others, however, the preparations change as the piece is played, so the presets are indicated by name, in boxes (the boxed "Etude5-2" in the figure above is an example. This is essential for practice, as the player will need to select the appropriate preset for rehearsing particular moments within a piece.

More detailed information about the instrument can be found at the end of this volume, and also on the website for the project:

http://manyarrowsmusic.com/nostalgicsynchronic/

This website includes a video about the instrument: seeing it in action is second only to actually playing it to understand how it works!

Mikroetudes: Contents

Forward

I grew up in a house full of harpsichords, clavichords, and lutes that my parents built, and with a family that played them with varying levels of proficiency (my sister, Jennifer, is an expert pianist). I quit piano lessons too early, claiming my violin studies were enough, but somehow ended up the one who tuned the harpsichord and its multiple sets of strings. I loved it. I also loved when it was out of tune, especially when its multiple sets which should have been in unison were instead "out" at some unseemly interval, sounding, as the acousticians say, "rough." I distinctly remember one party when my friends egged me on to play the Bach D-minor two-part Invention with the harpsichord in such a "rough" state; somehow this odd party trick would inspire fits of gleeful twisted dancing—I had unusual friends!

The point being: I grew up with my hands inside instruments of various sorts, and I was used to messing with these instruments, sometimes playing them myself, and other times getting them ready for others to play. Somehow, decades later, I'm still doing that, whether writing new music, hacking up new instruments, or cross-tuning my fiddle; it's incredibly inspiring! And this is the story of the "prepared digital piano," the *Nostalgic Synchronic Etudes*, and this volume.

I built the prepared digital piano to explore a number of musical ideas, but also just because I like to build things and to program. After sharing some of the early *Nostalgic Synchronic Etudes* with a few friends and in a couple different venues, I began getting requests for the instrument, and that's where the idea for this volume came from: wouldn't it be great to have a volume of short pieces that various people write for instrument, as a way for them to try writing for the instrument, but also to create something that other pianists and musicians could play to explore the instrument and the different musical challenges and ideas it presents?

Bartók's *Mikrokosmos* was an initial point of reference, and gave us the title for this volume (and the suggestion that there may be more to come), but this

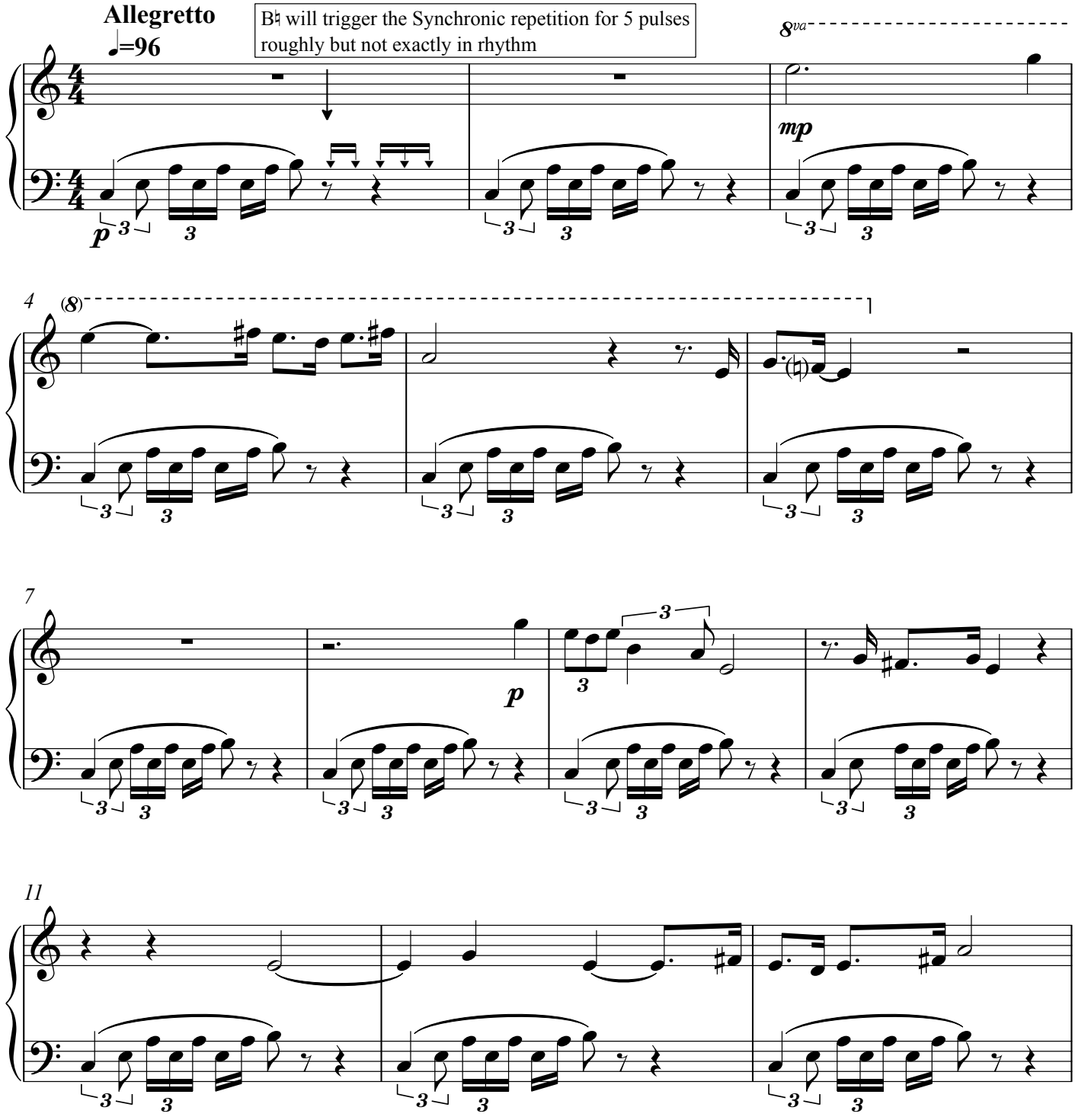
has inevitably turned out somewhat differently than the *Mikrokosmos;* rather than being a graded set of pedagogical pieces by one composer, this is a grab bag of short pieces by a group of different composers, pieces of varying degrees of difficulty and coming from different stylistic perspectives. This is why I decided to simply order them alphabetically by title, rather by some other much harder to articulate criterion. My hope is that musicians interested in exploring the instrument will be able to open to any random page and find a piece that is a useful starting point.

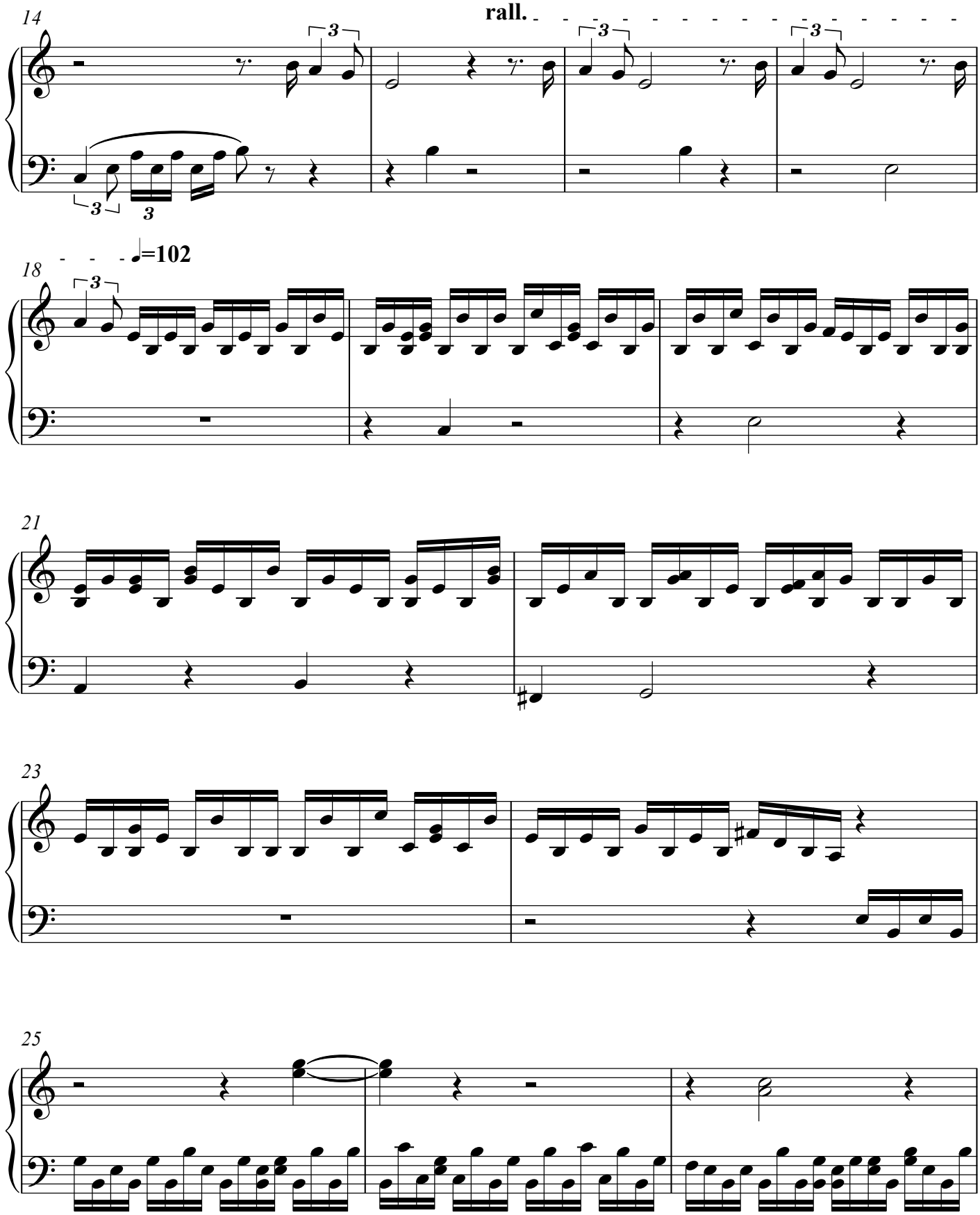
Fortunately, I still have unusual friends: some old friends and some new friends that I've made just through this project. I am absolutely *thrilled* with what these friends have come up with; the range of approaches, of sounds, of musical sensibilities, of delightful misuses of the instrument, all add up to a collection that is for me full of beauty and surprises. I am grateful to them all for diving into this project with enthusiasm and thoughtfulness, and hope that musicians find these mikroetudes as useful and inspiring as I do.

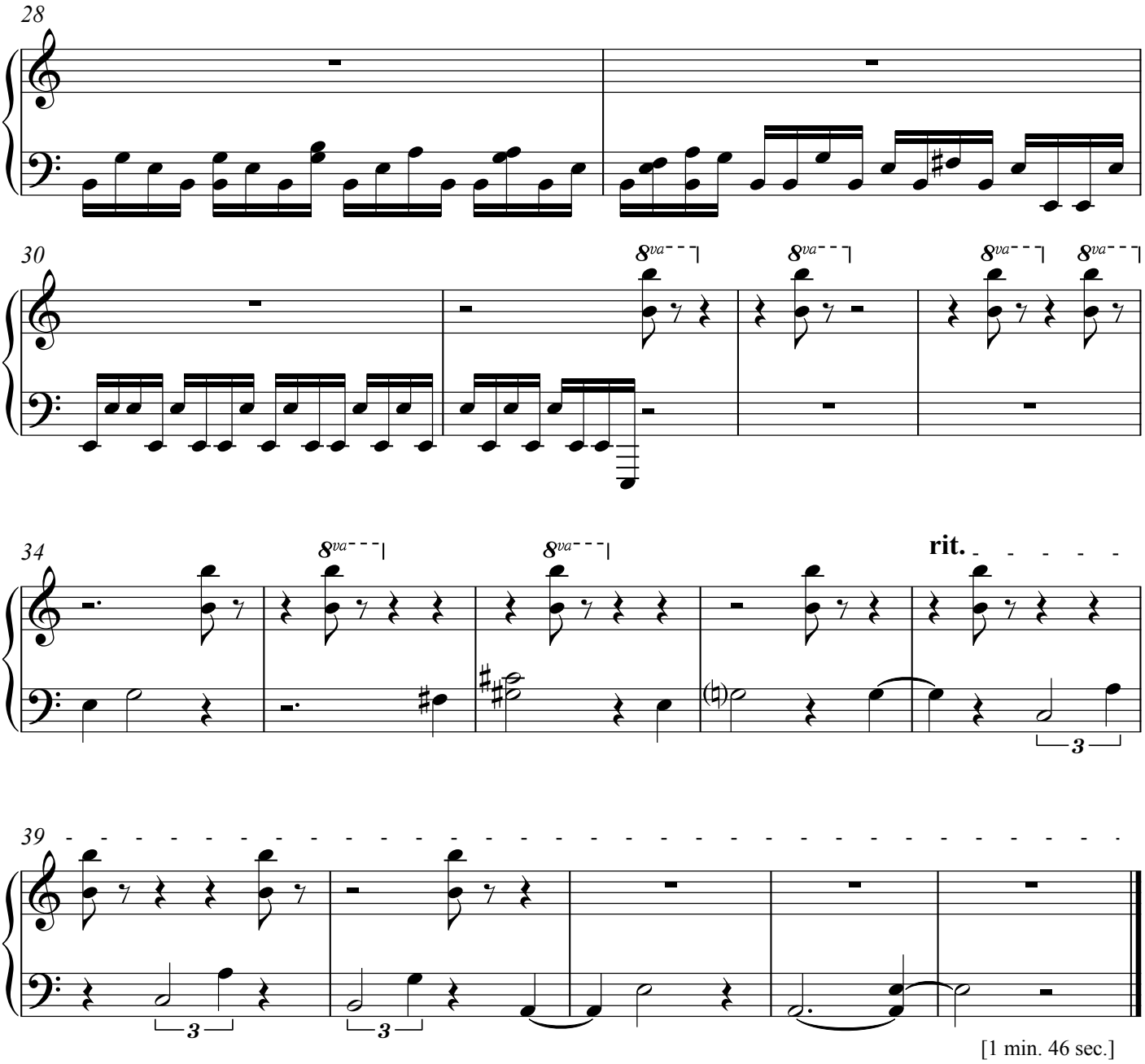
—Dan Trueman
August 2015

And so...

Louise Fristensky

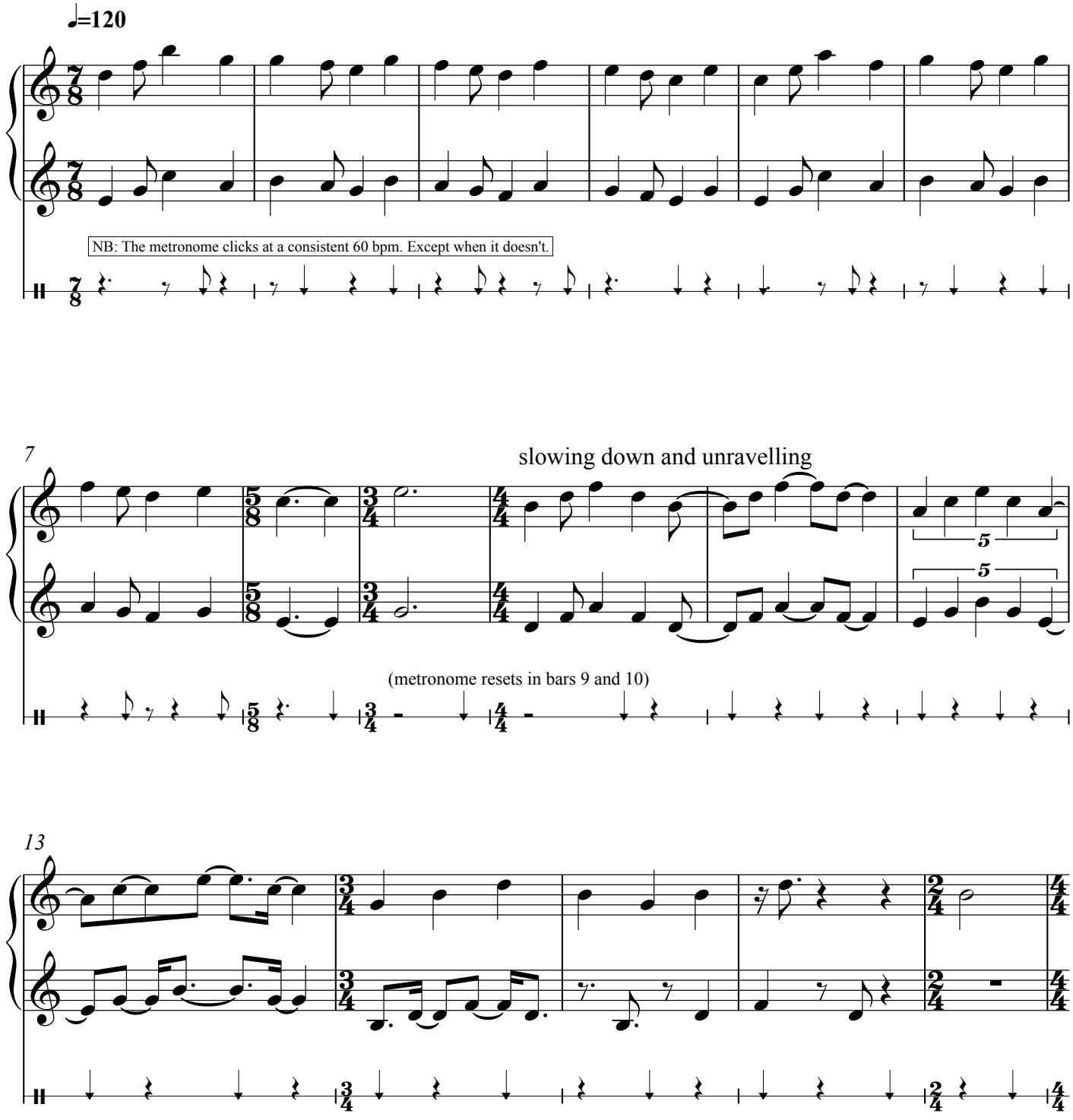


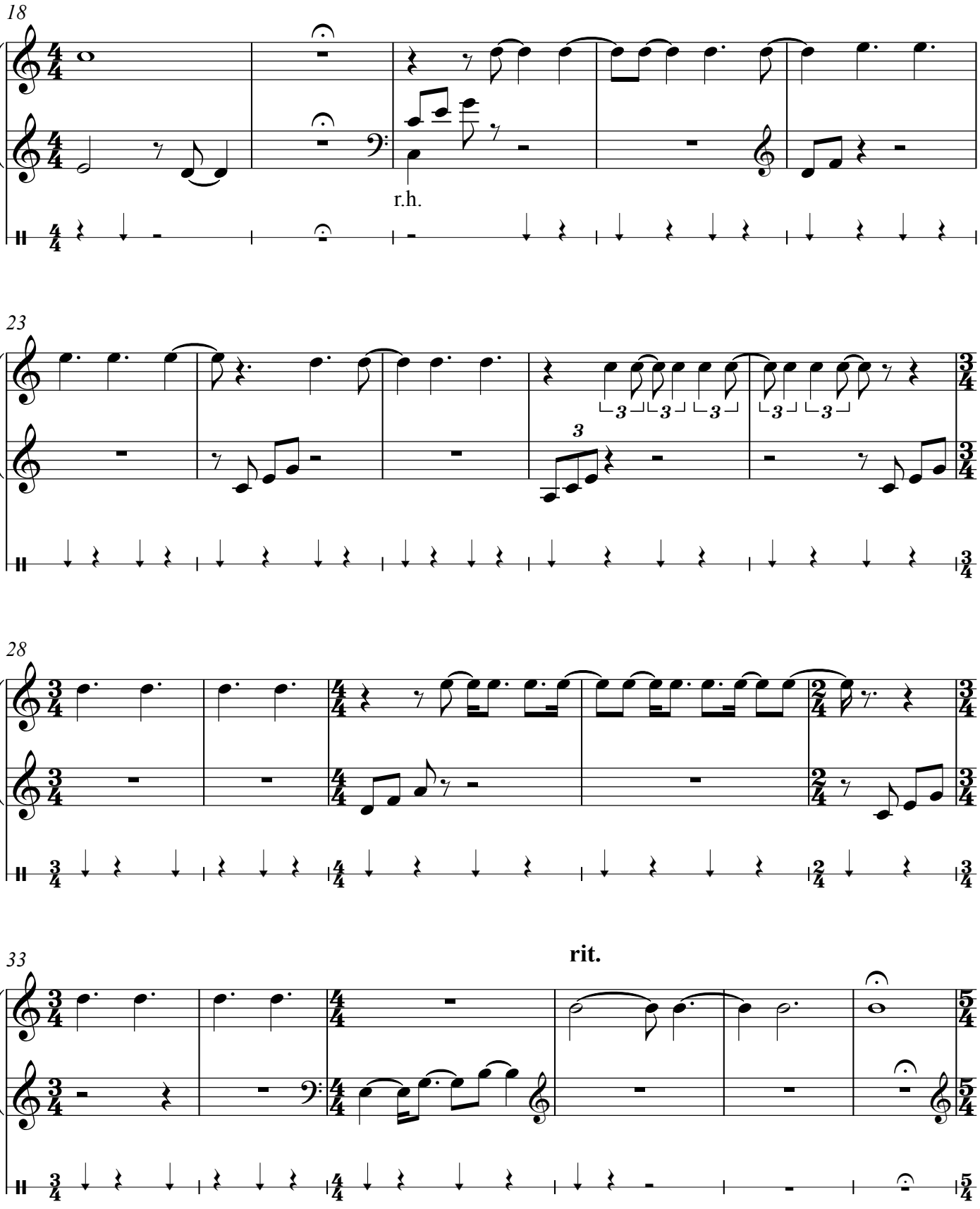

14
rall.
18
♩=102
21
23
25

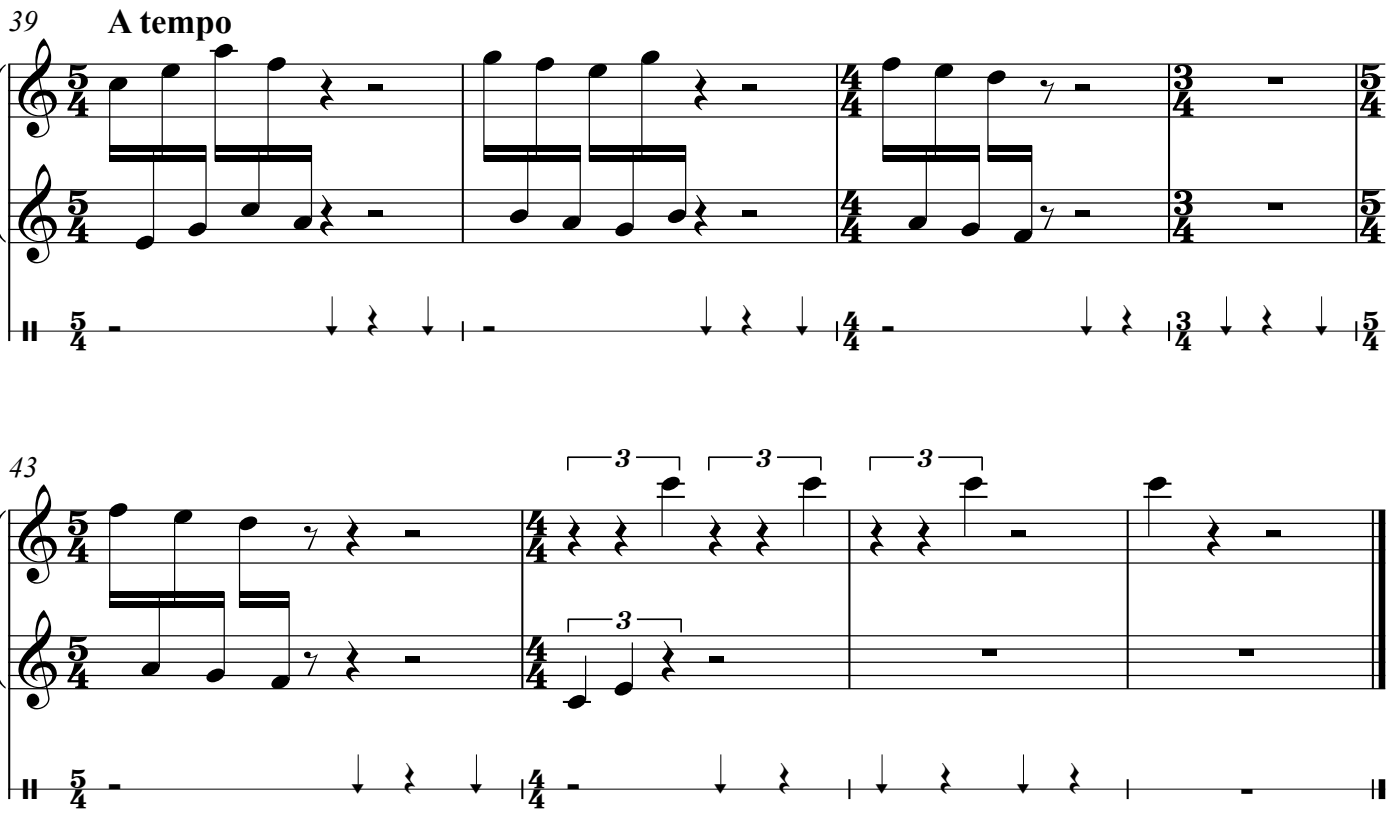

28
30
8va
34
rit.
39
3
[1 min. 46 sec.]

Around 60

N. Cameron Britt




18
r.h.
23
28
33
rit.



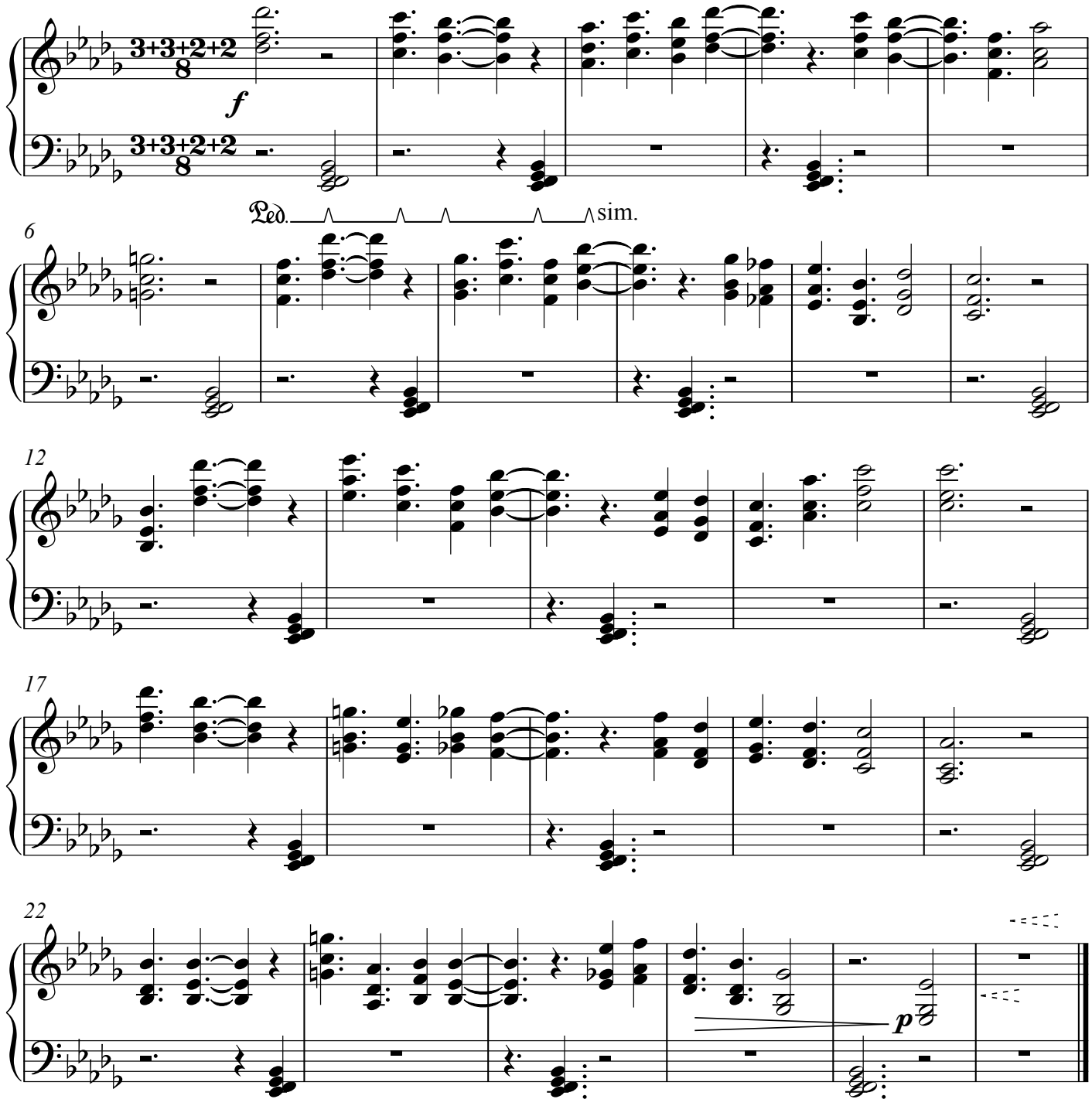
[1 min. 26 sec.]

Circleville

Nate May

Circleville| (synchronic pulses of changing tempos throughout; presets will change as you play)

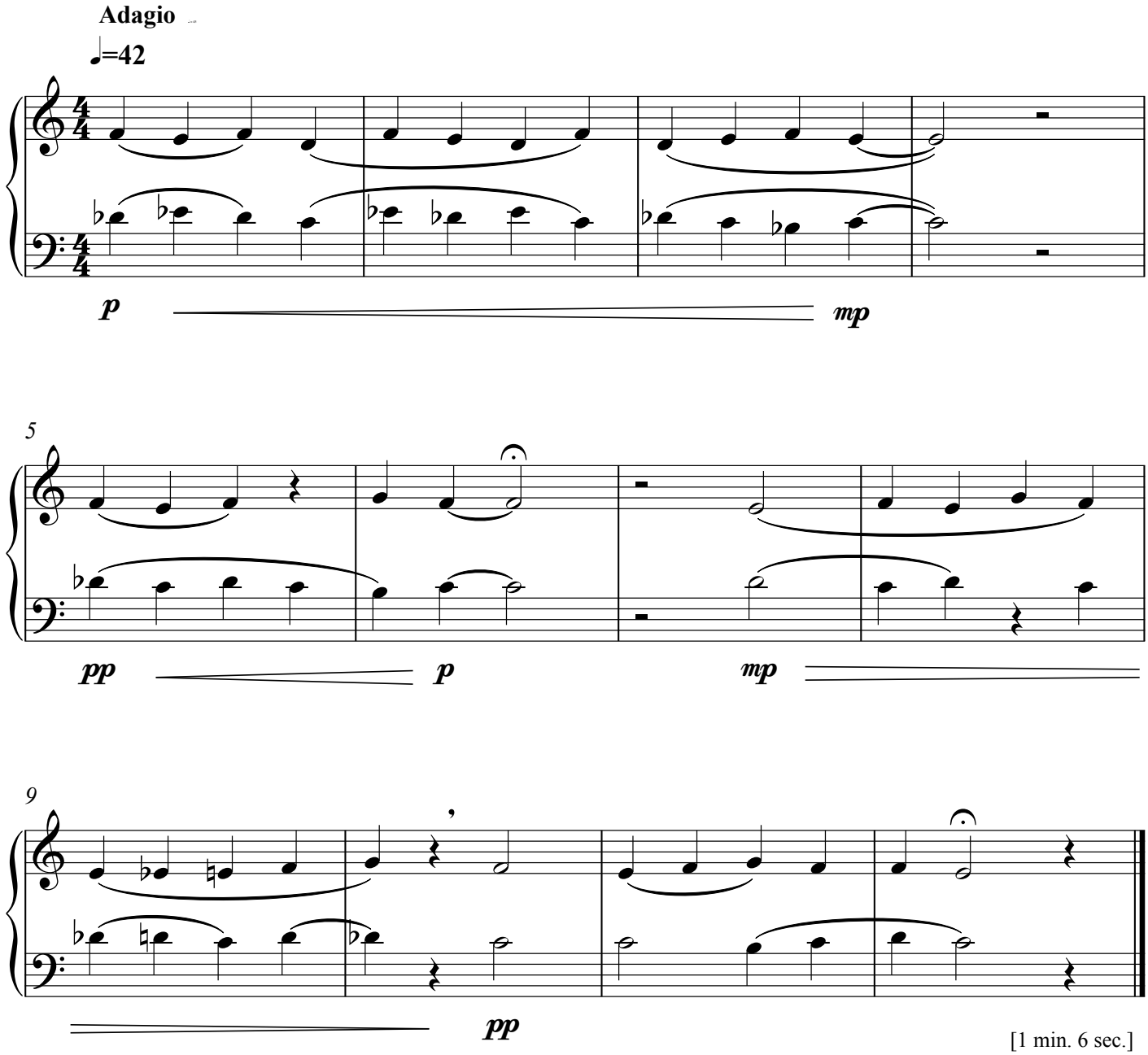
With aplomb. ♩ = 126 / ♩. = 84.



[1 min. 4 sec.]

Crests

Seth Cluett



[1 min. 6 sec.]

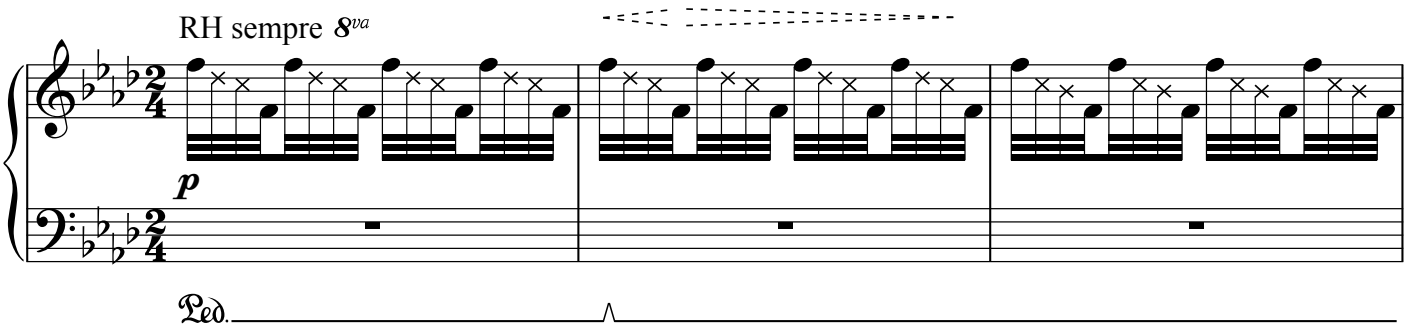
Cygnet

Nate May

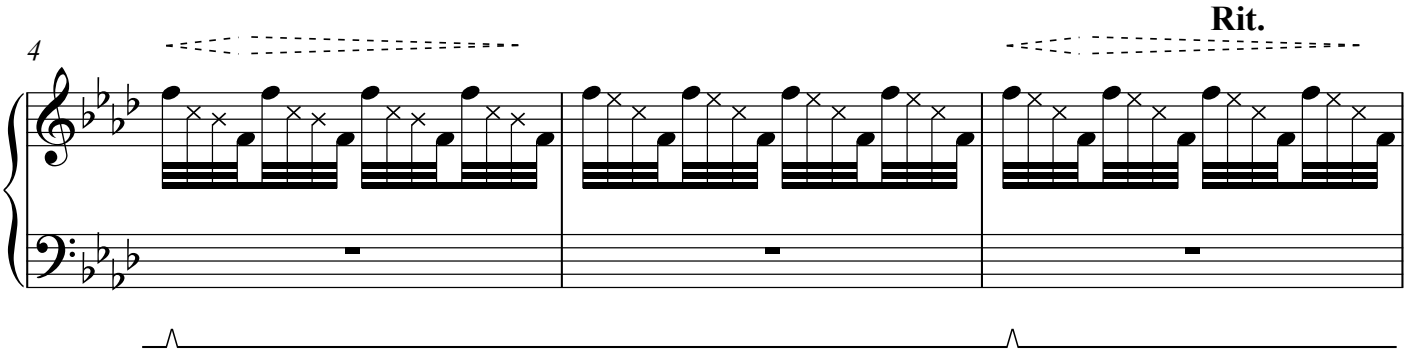
In General Settings, increase Nostalgic Gain to 1.5.

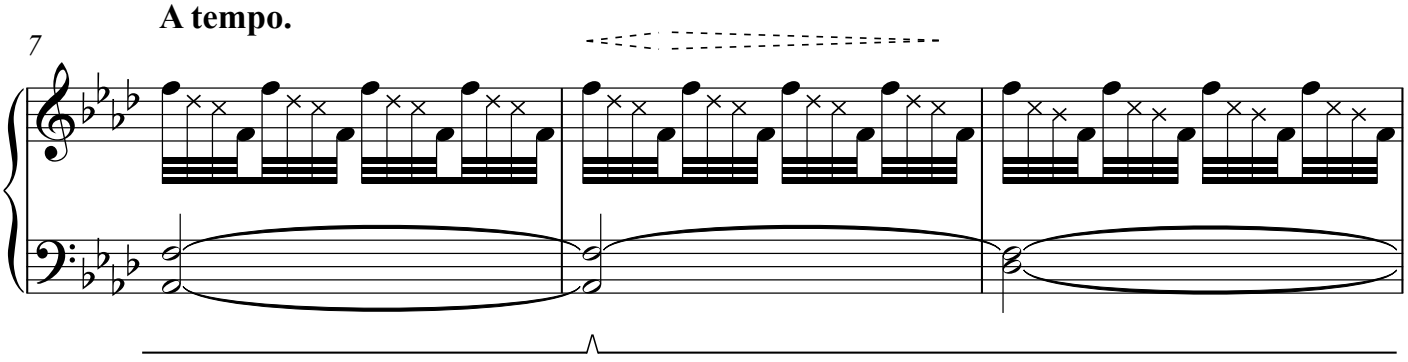
Quiet and sweet. ♩ = 63.

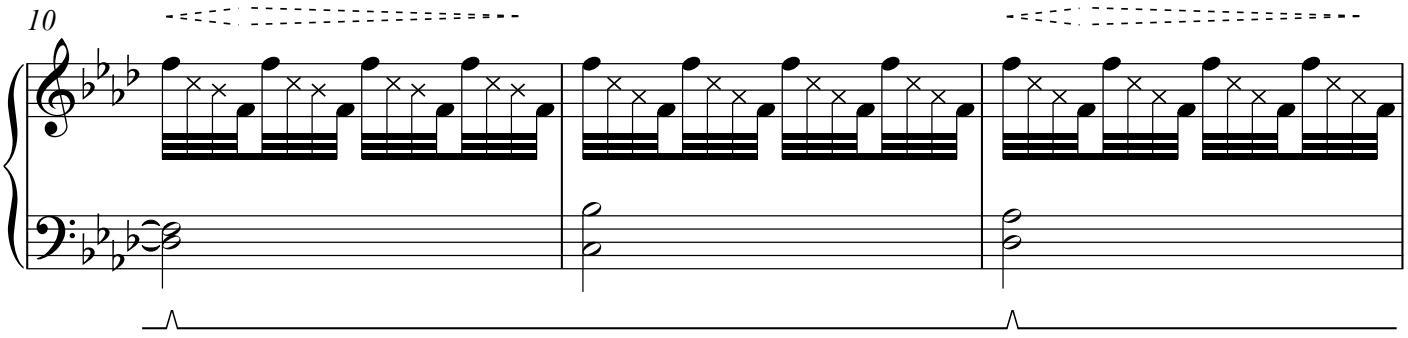
RH sempre *8va*

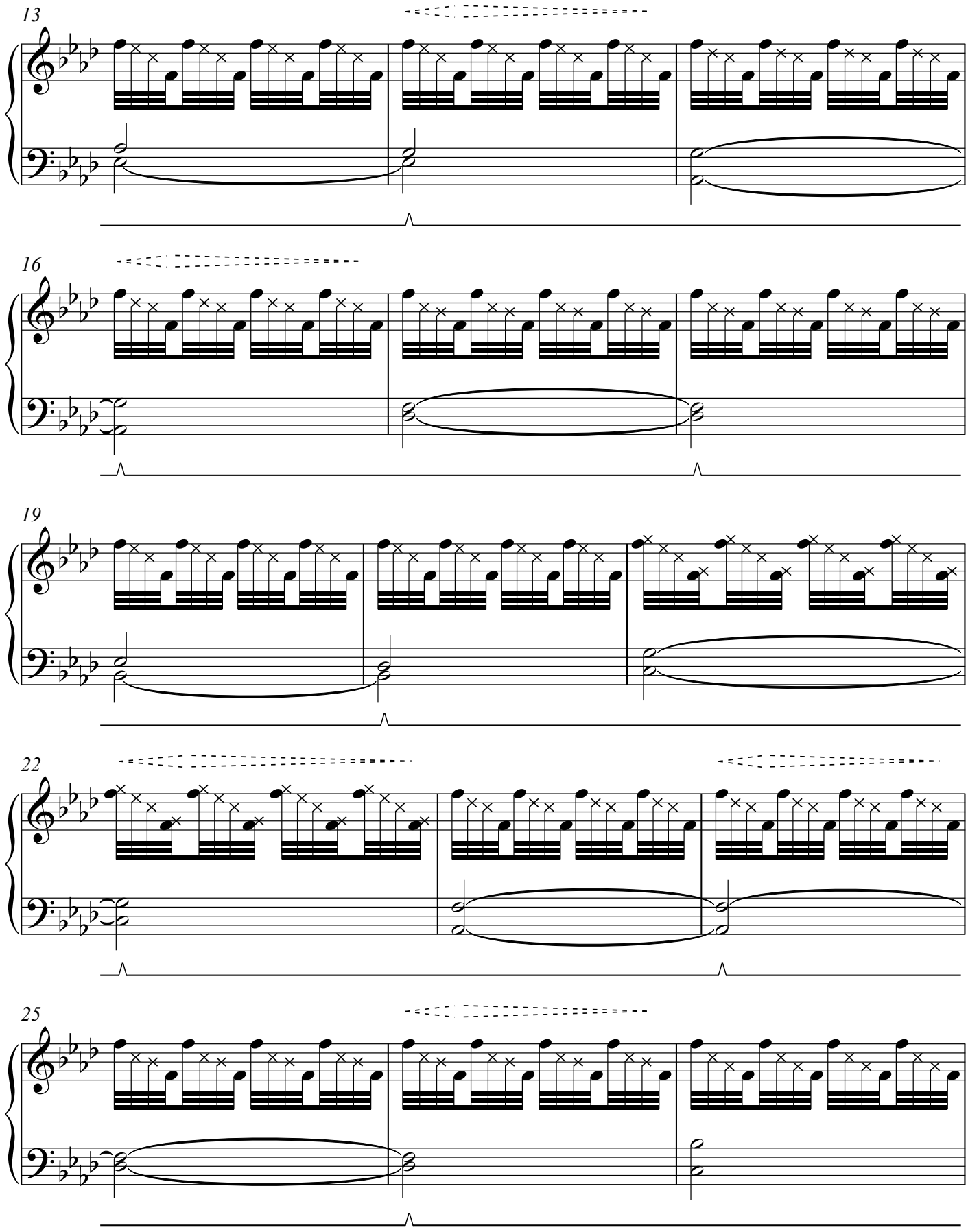


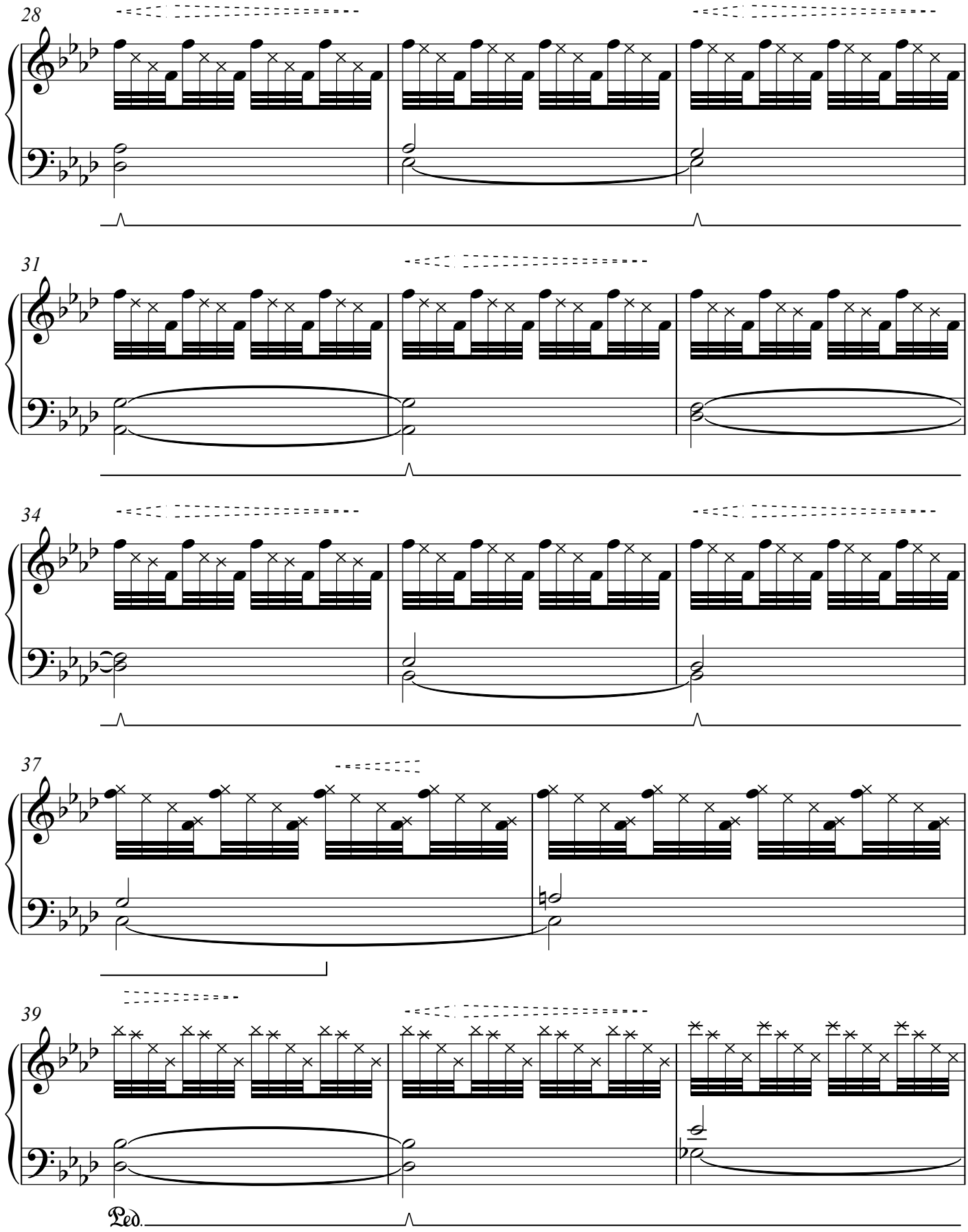
(x notehead denotes muted note; play as usual, but they will not sound)

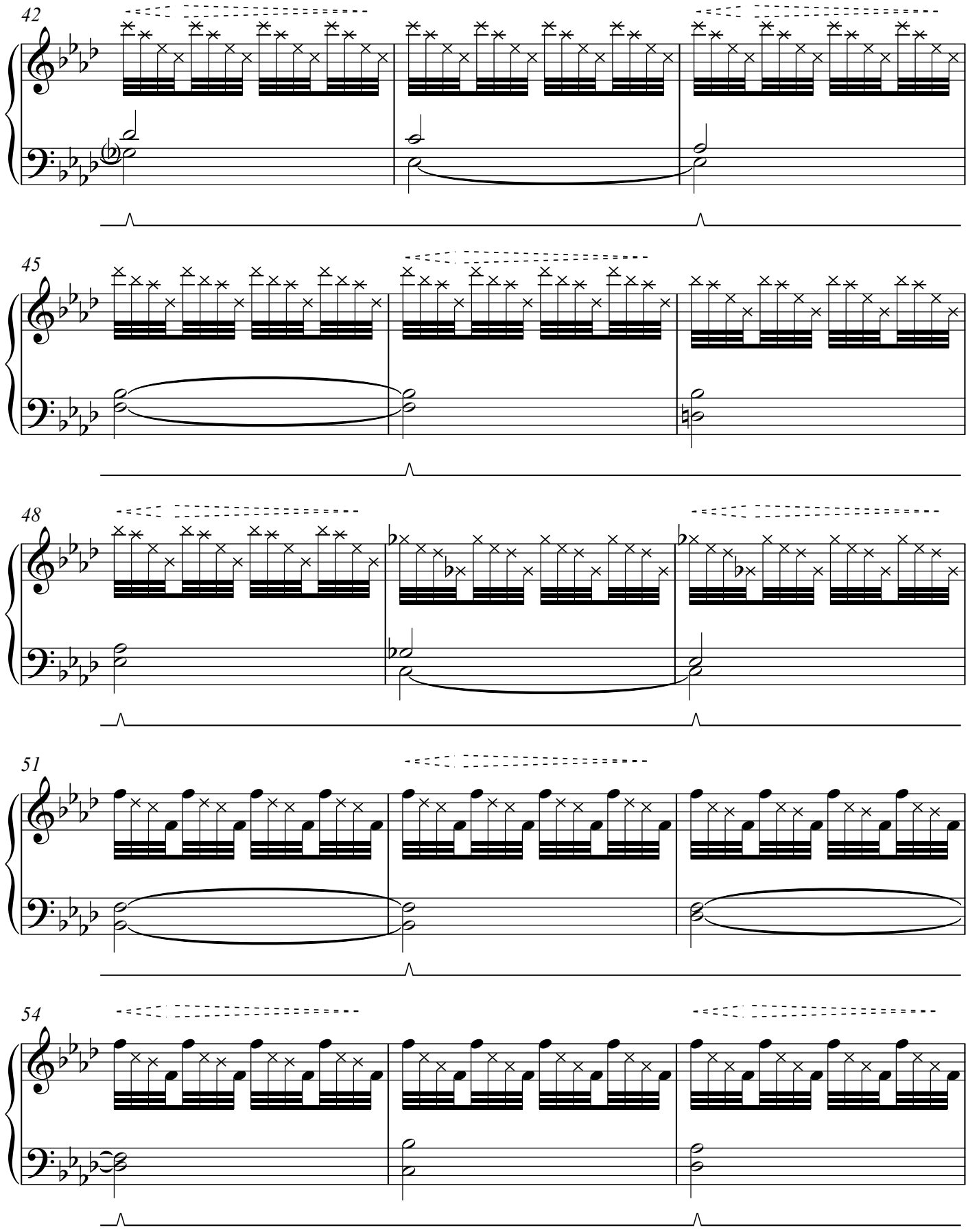


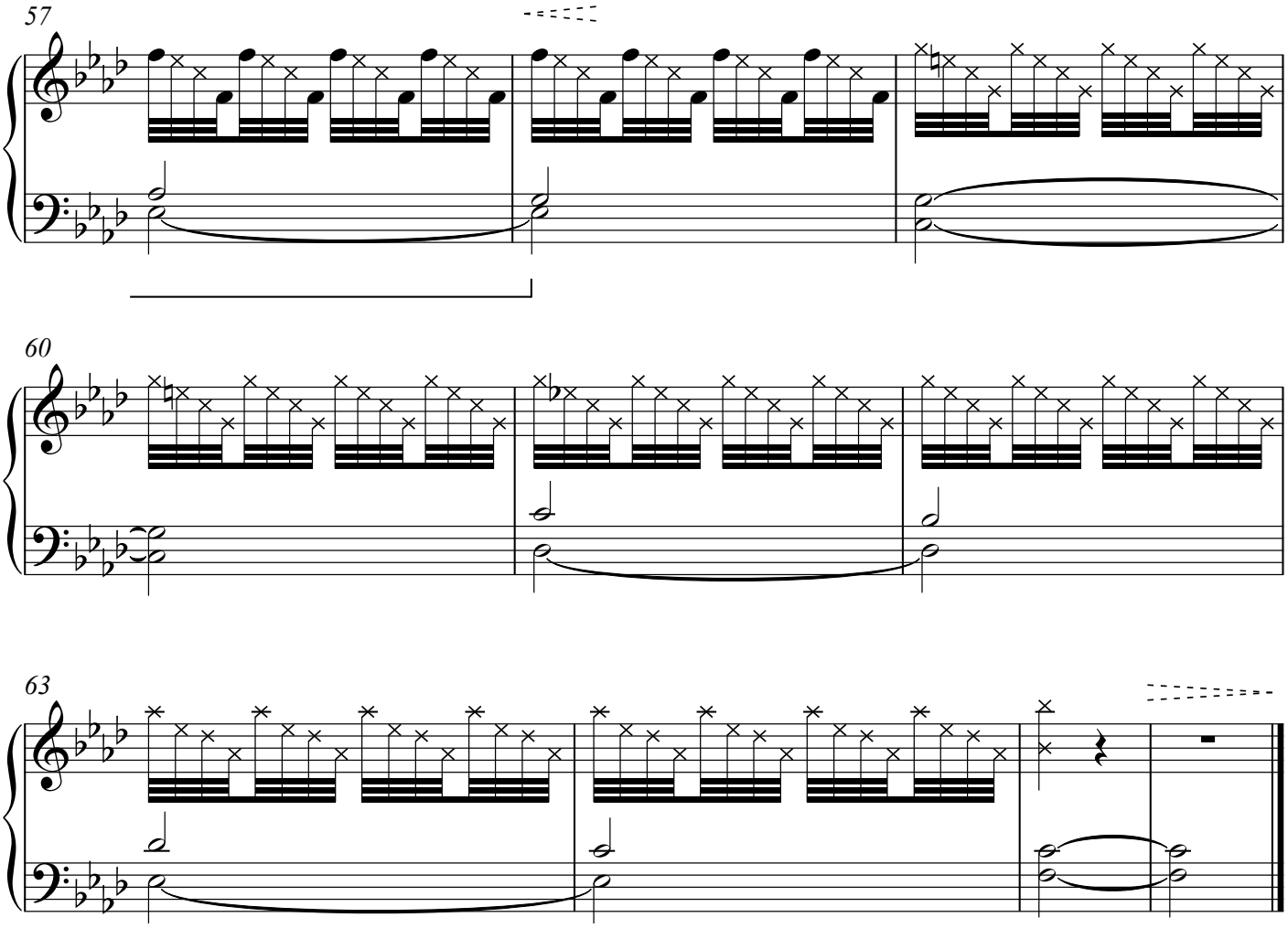





13
16
19
22
25


28
31
34
37
39
Ped.

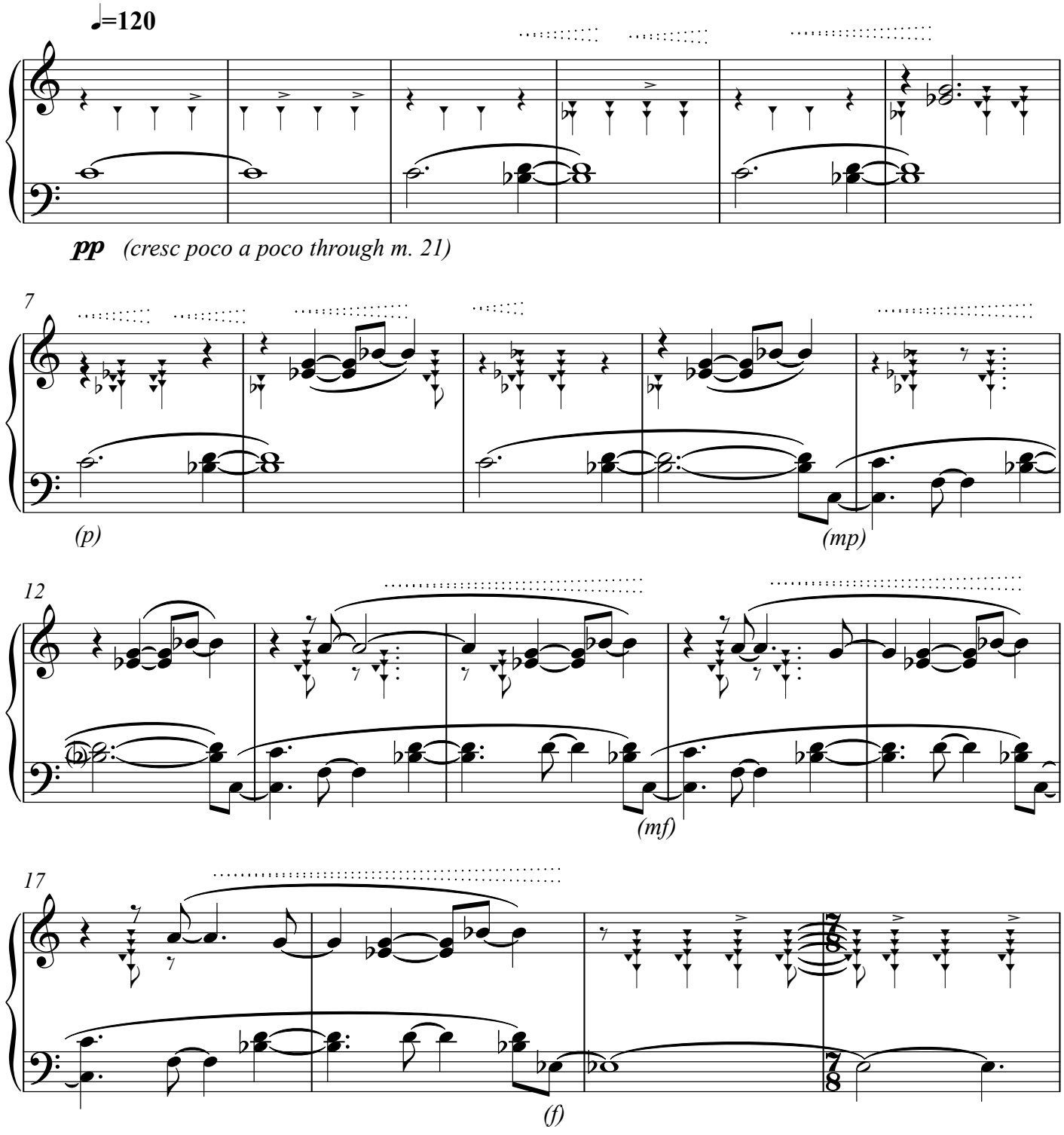

42
45
48
51
54

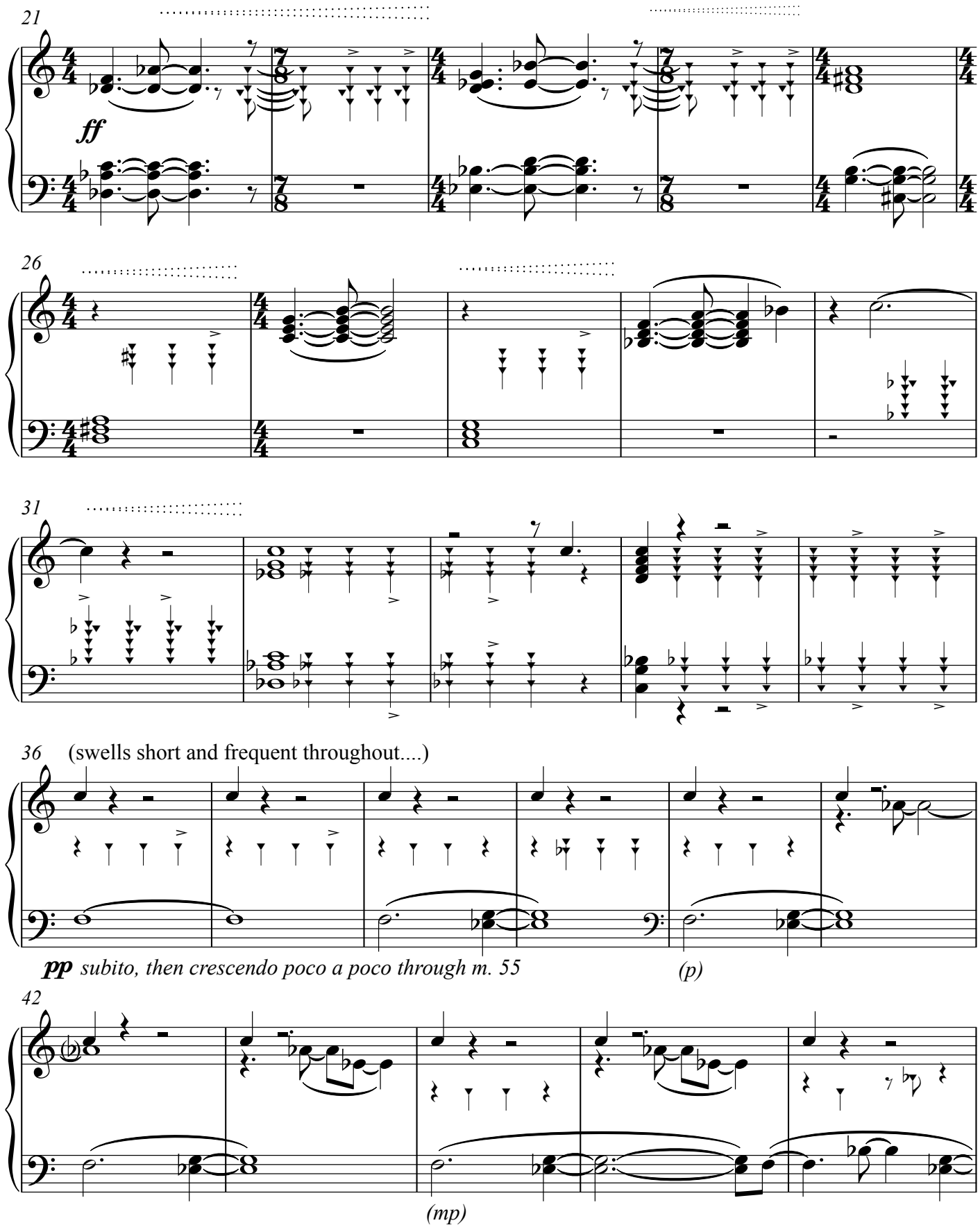


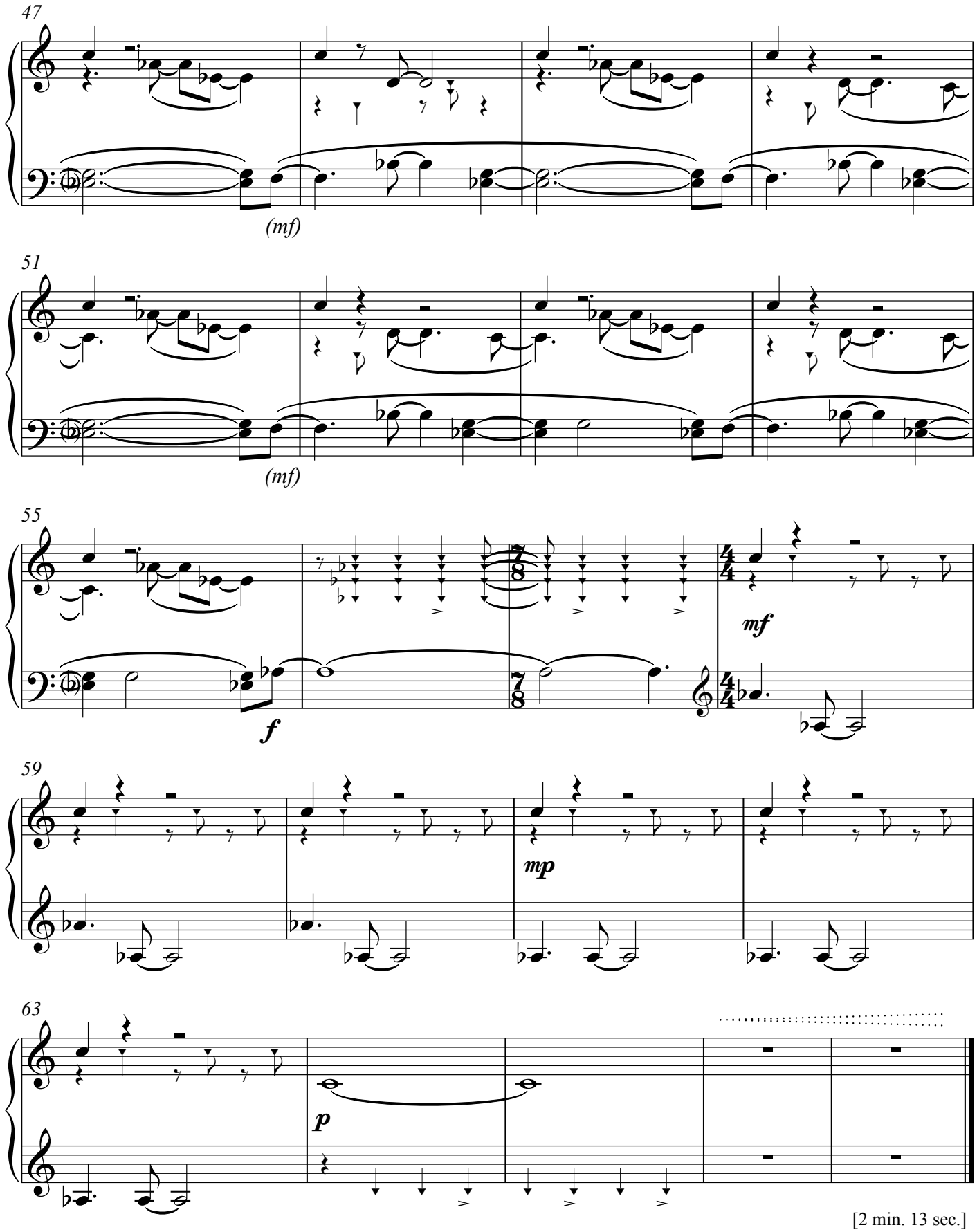
[2 min. 6 sec.]

Daily Decrease

Andrea Mazzariello




21
ff
26
31
36
(swells short and frequent throughout....)
pp subito, then crescendo poco a poco through m. 55
(p)
42
(mp)

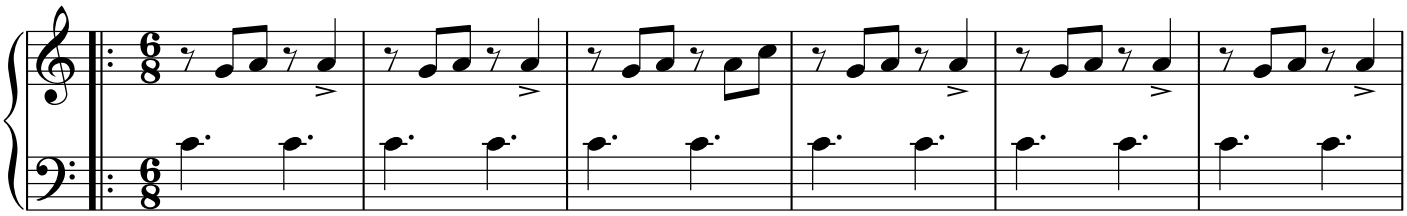


[2 min. 13 sec.]

Didymus

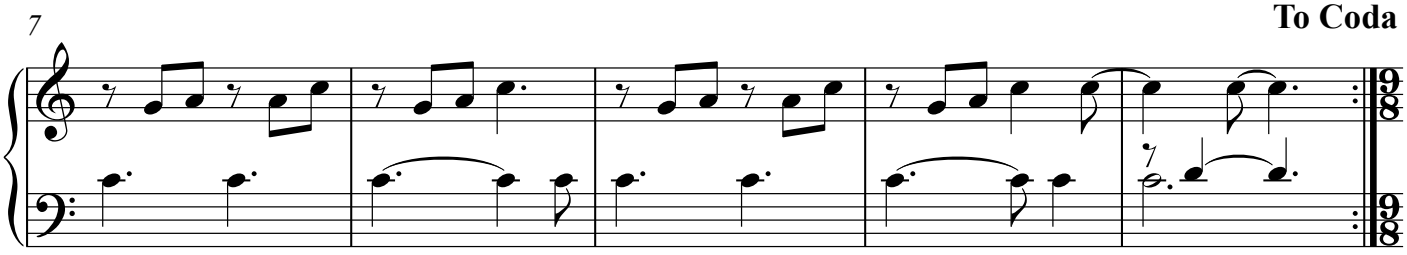
Dan Trueman

Quick!

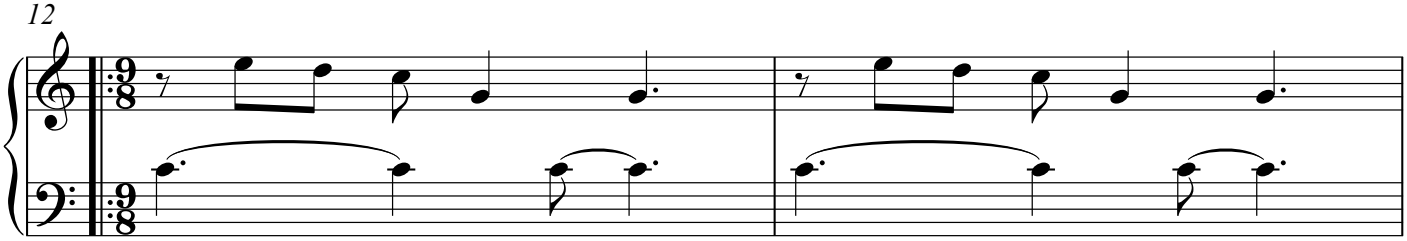


7

To Coda

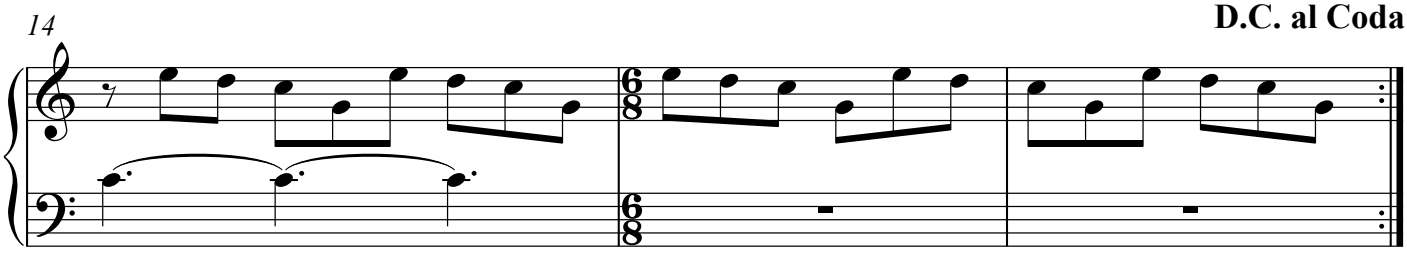


12



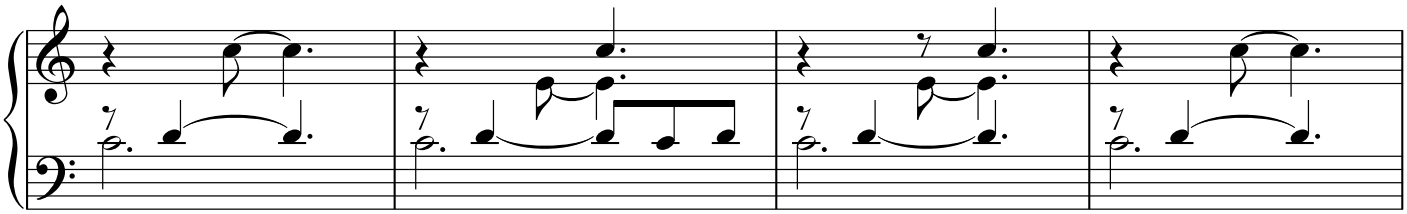
14

D.C. al Coda



CODA

17



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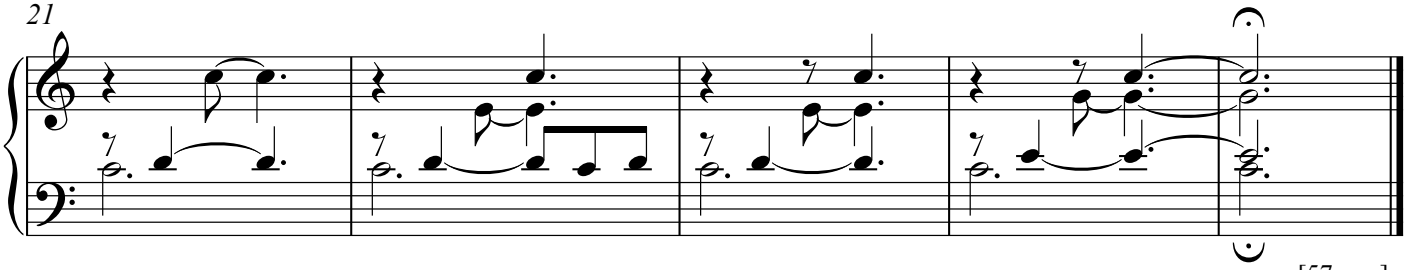


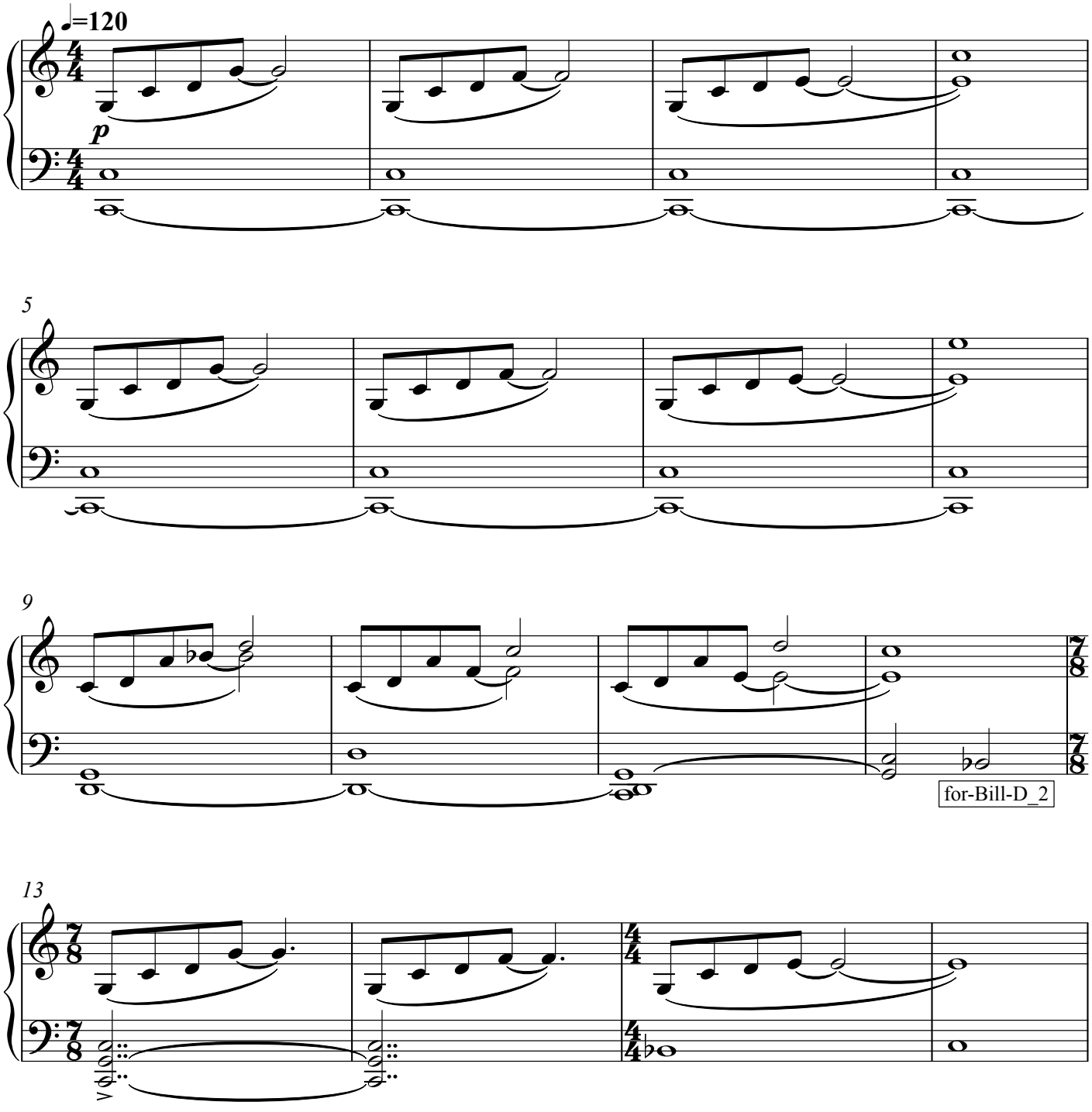
[57 sec.]

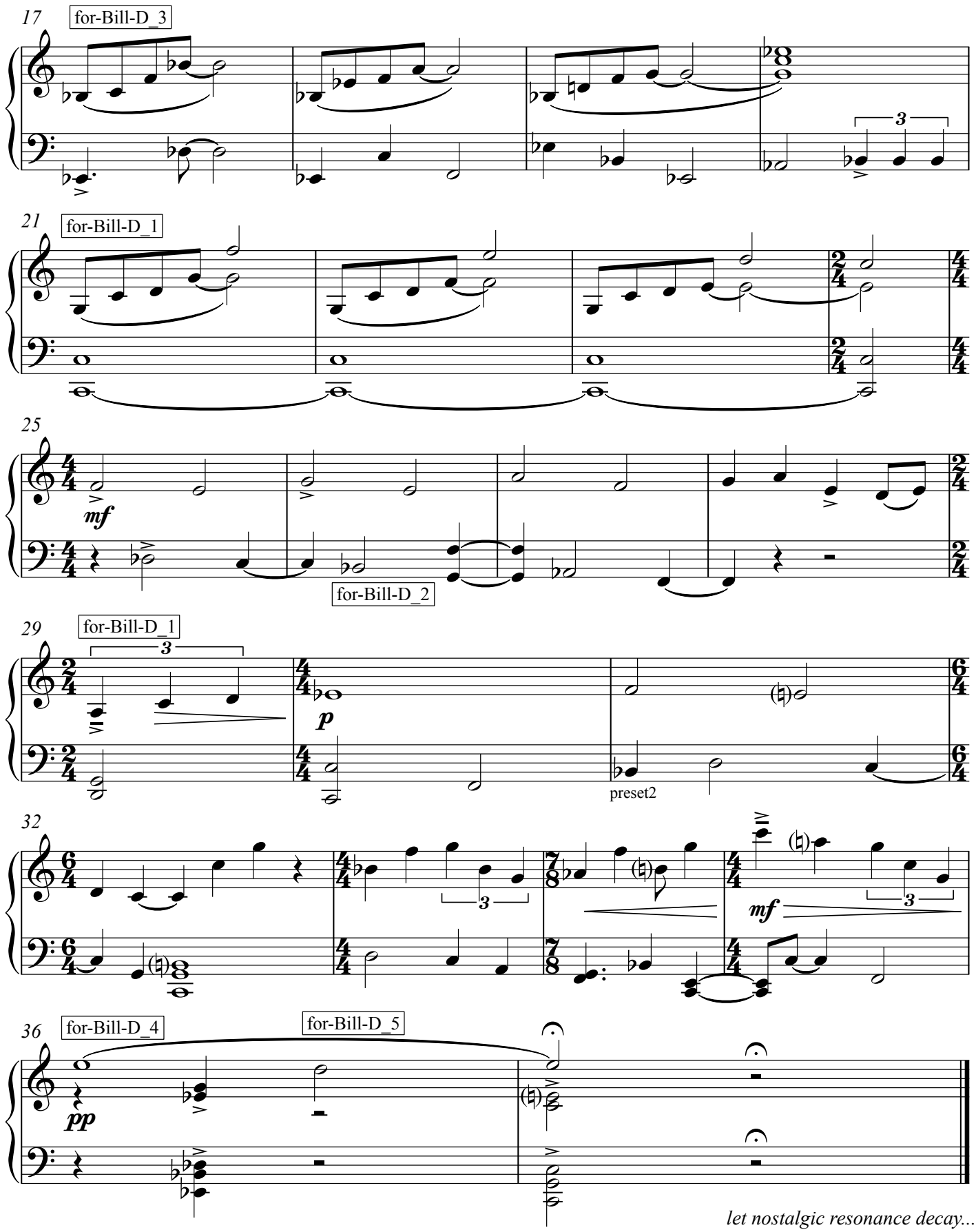
for Bill D.

Quinn Collins

Sweetly, but also with a very deliberate and meditative purpose

for-Bill-D_1





let nostalgic resonance decay...

[1 min. 32 sec.]

Gigue Interrupted

Jennifer Trueman

JennifersGigue1

♩.=120

8va

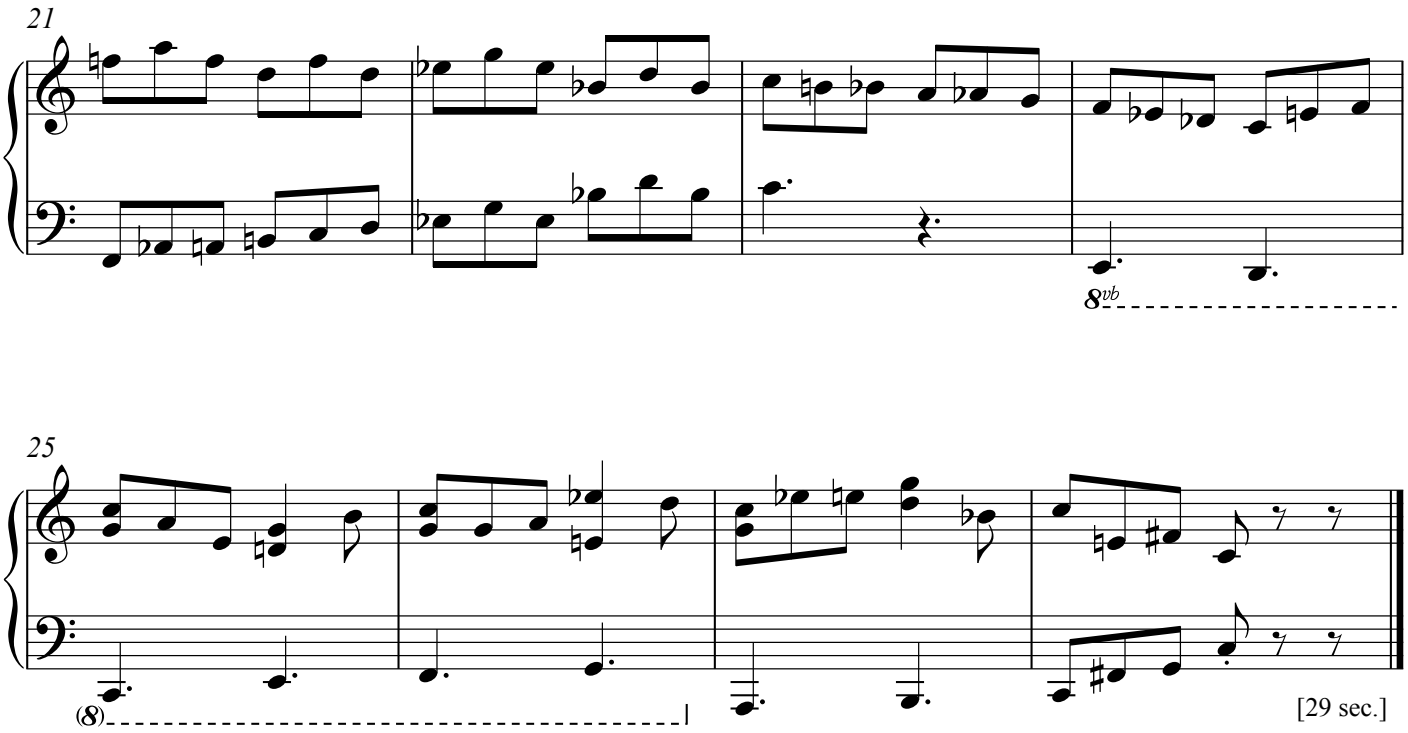
7

JennifersGigue2

13

JennifersGigue3

17 8va

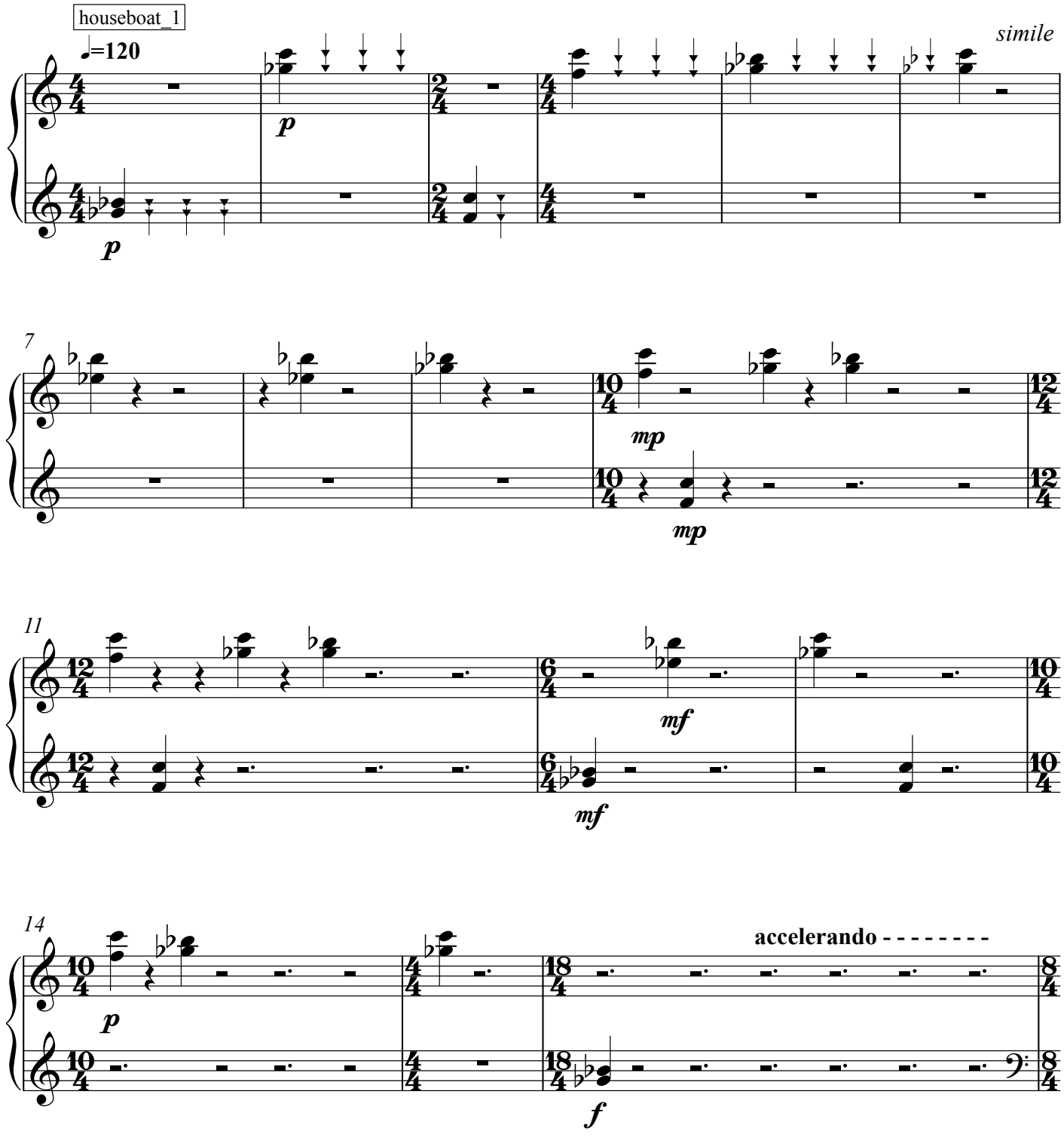

21
8vb

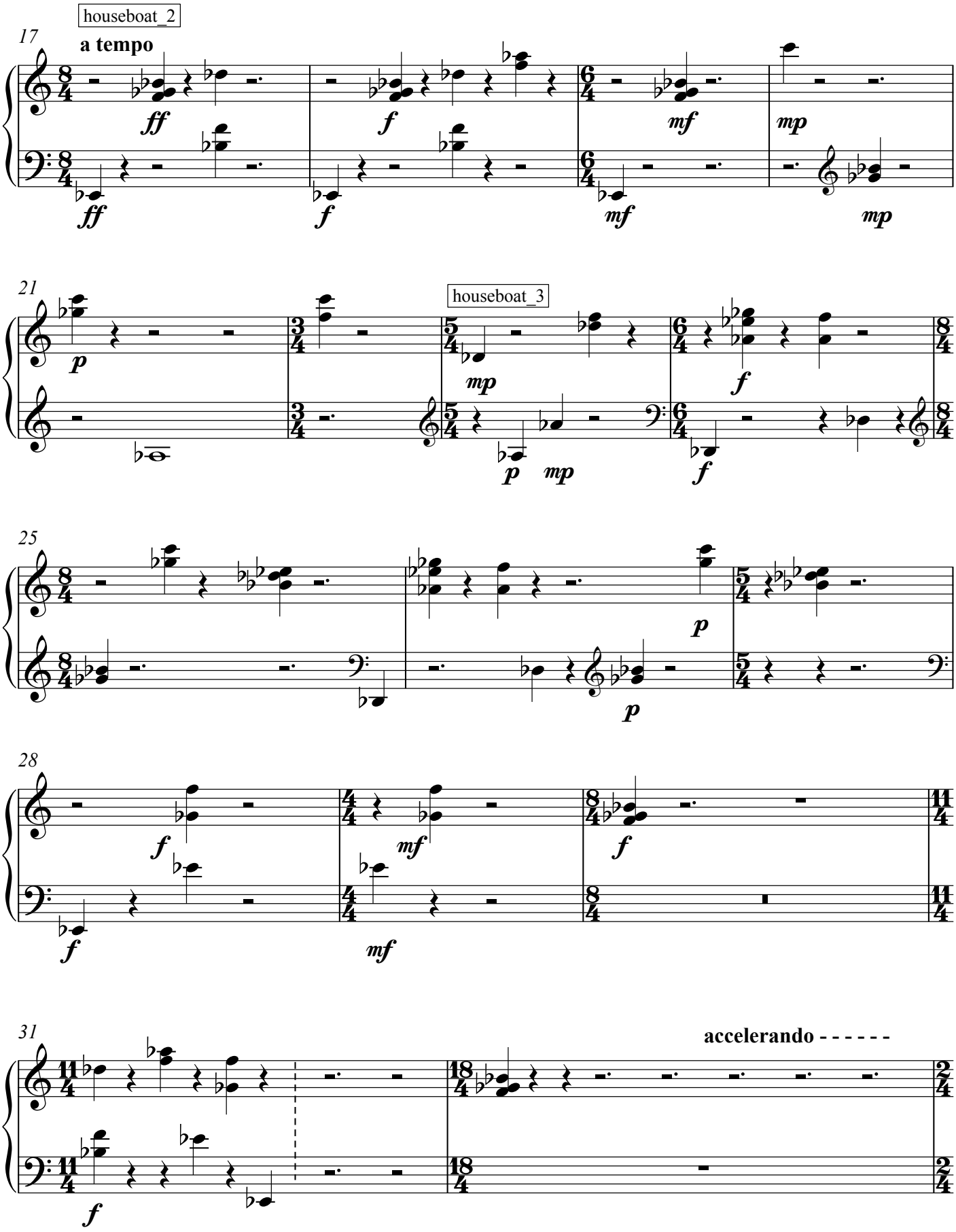
25
(8)
[29 sec.]

Houseboat

see the General Settings at the end of this etude and adjust accordingly
(and be sure to revert to the defaults when you are done with this one!)

Van Stiefel




houseboat_2
17
a tempo
houseboat_3
21
25
28
31
accelerando - - - - - -

houseboat_4

33 **a tempo**

f *mf*

f *mf*

42

houseboat_5

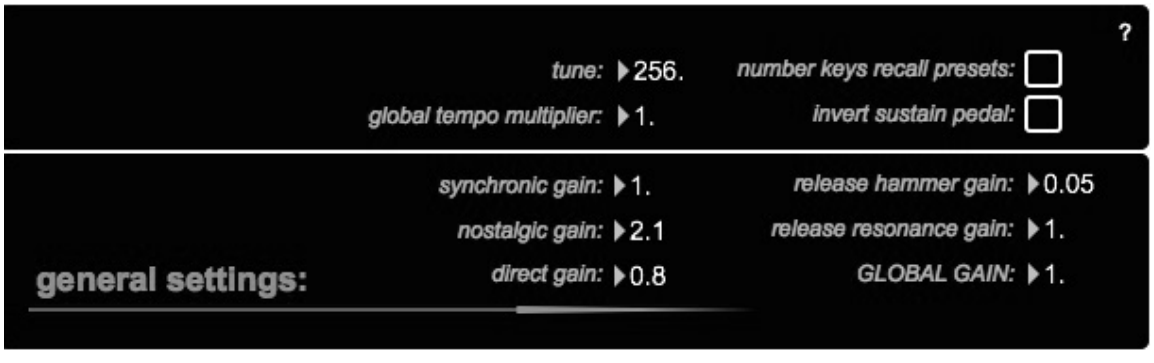
mp

mp

51

56

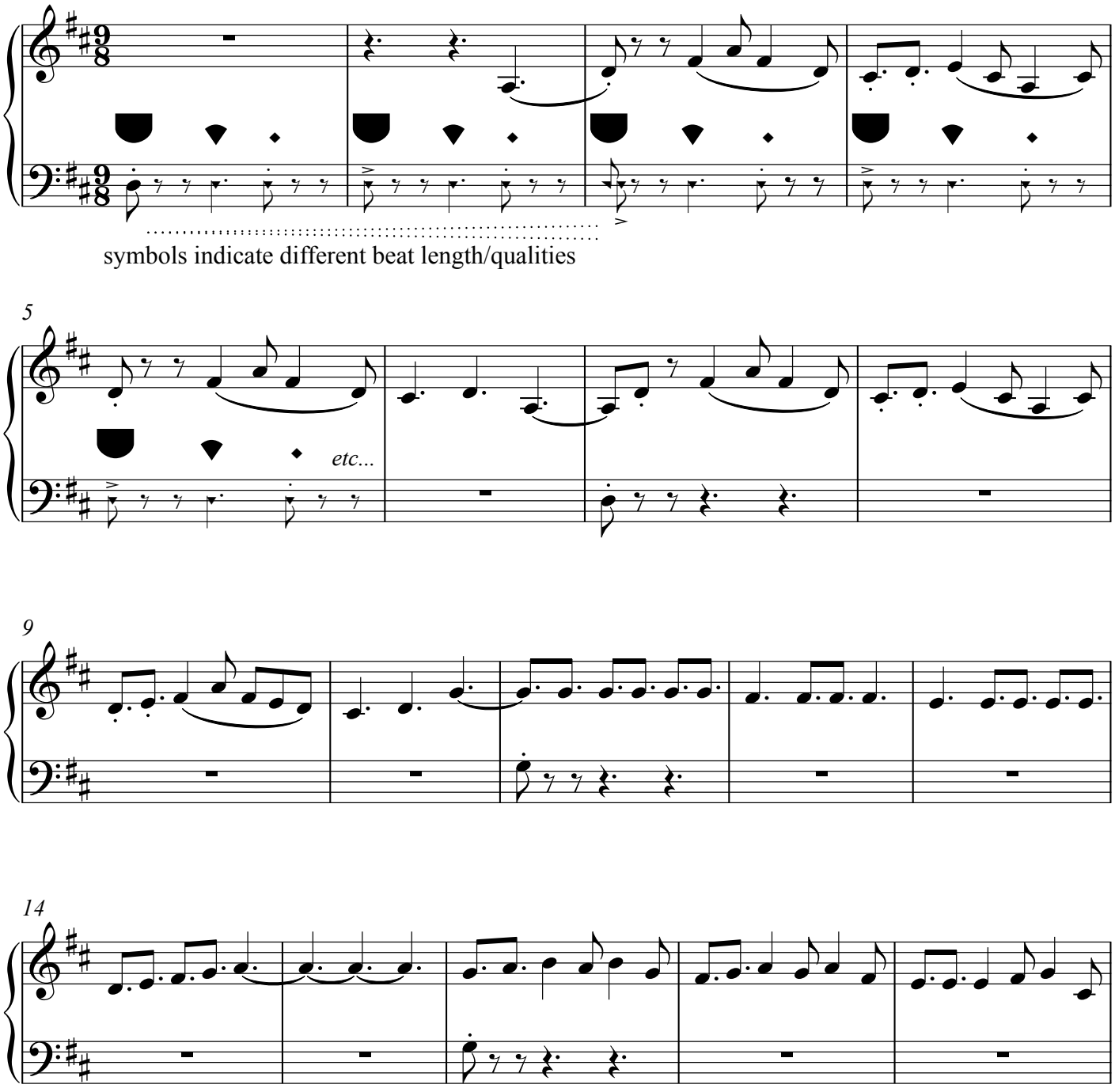
(accelerando - - - - - -)

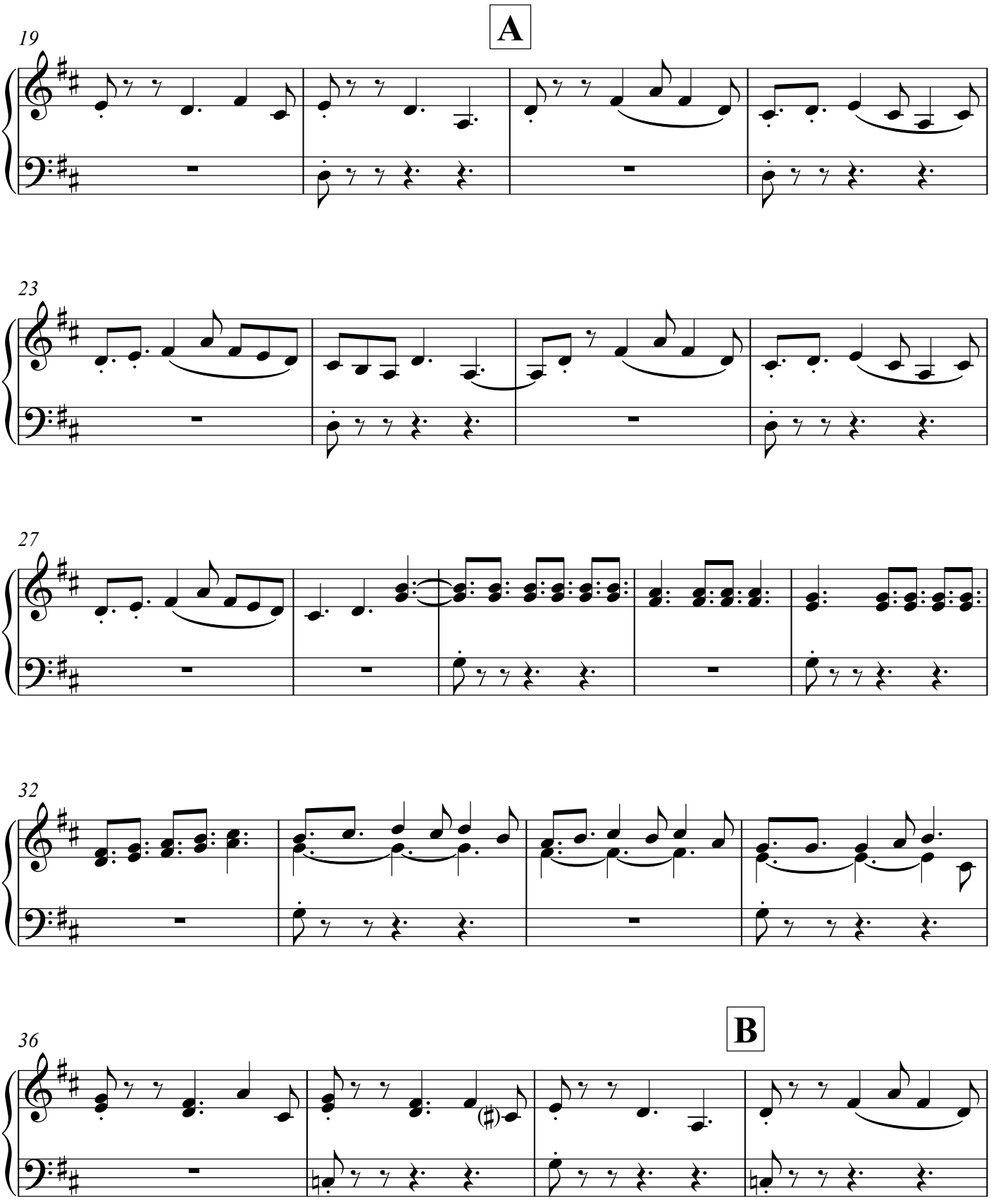


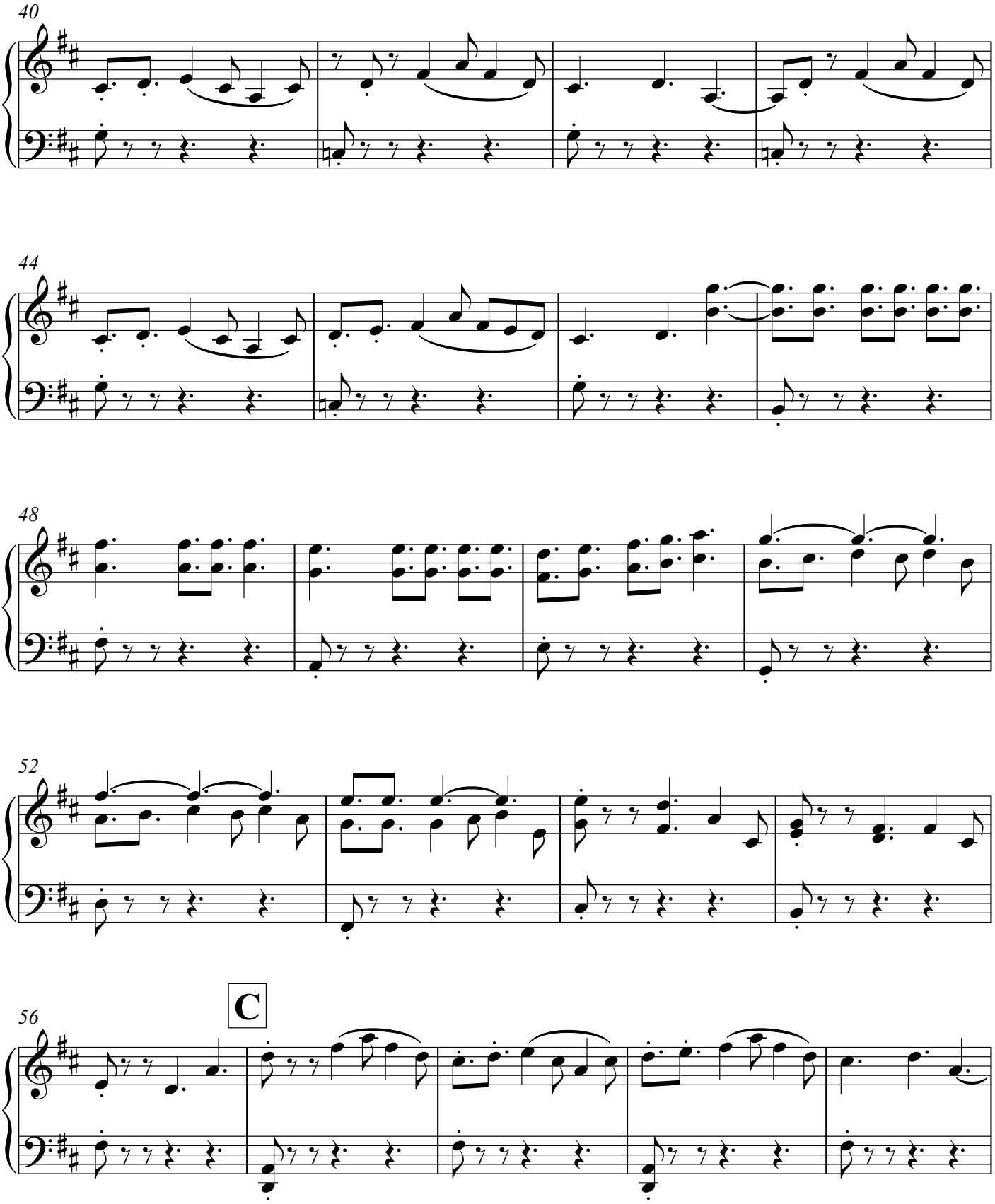
Hurra *for Josh Q*

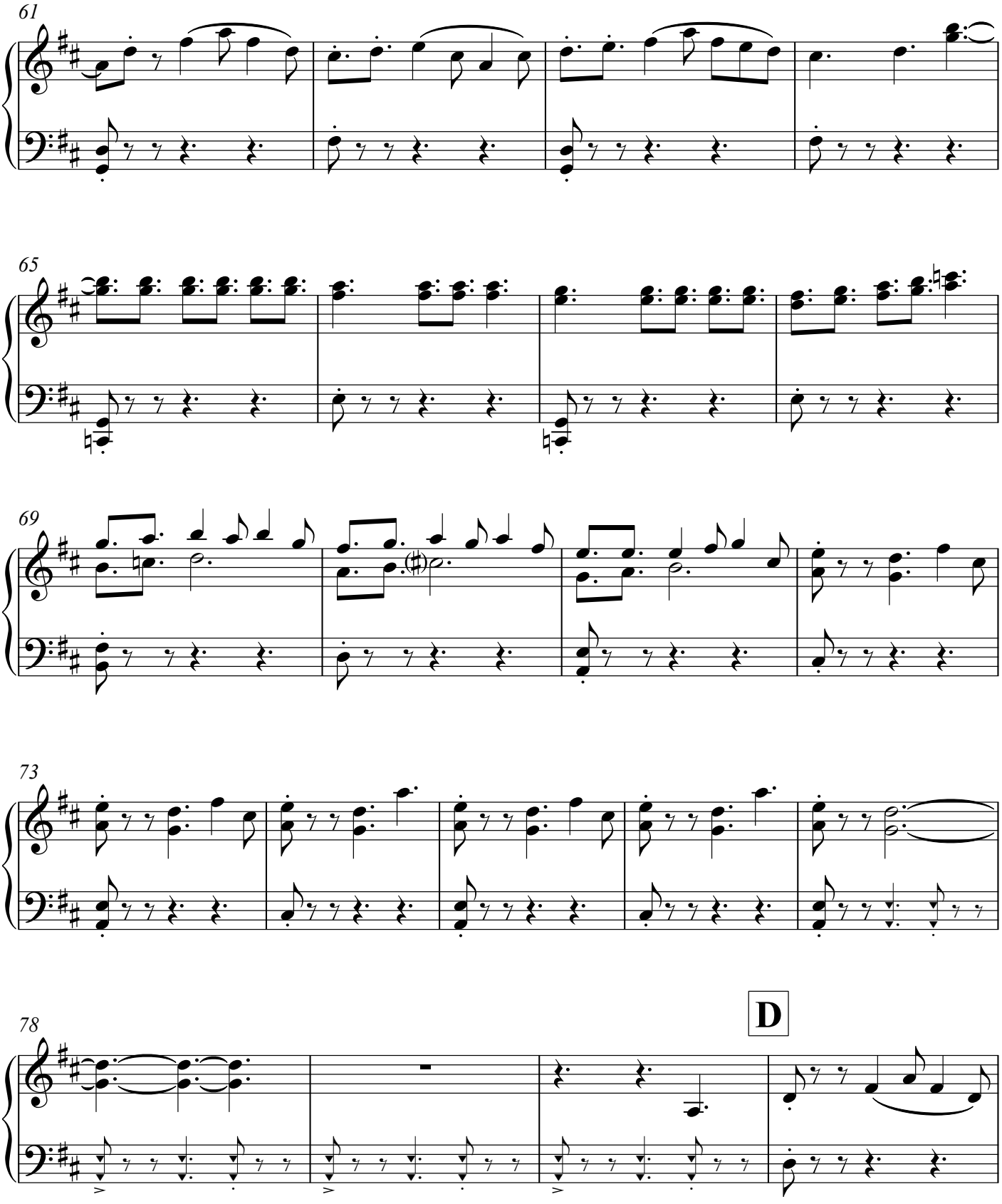
Traditional Norwegian/Dan Trueman

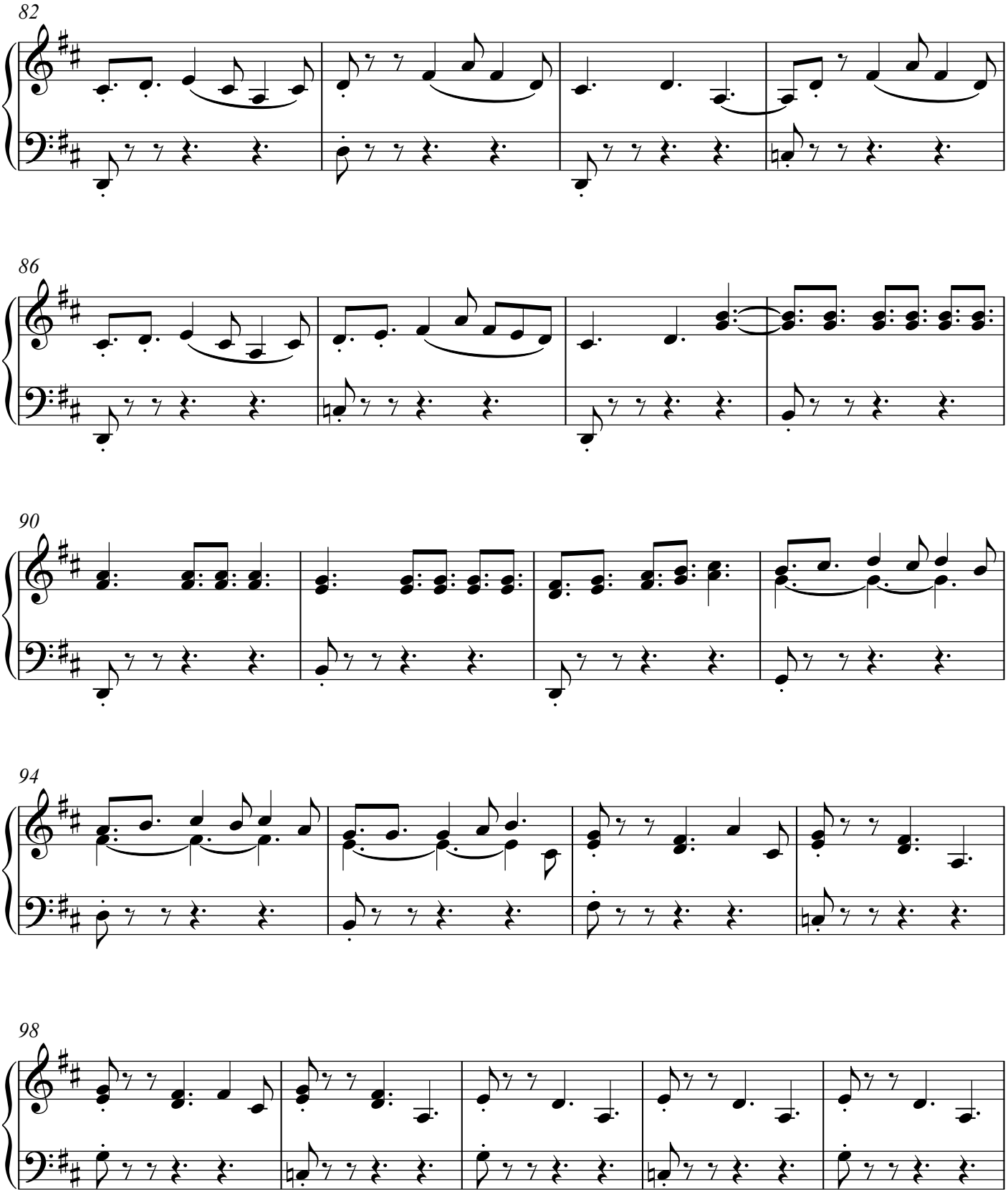
"Telespringar"

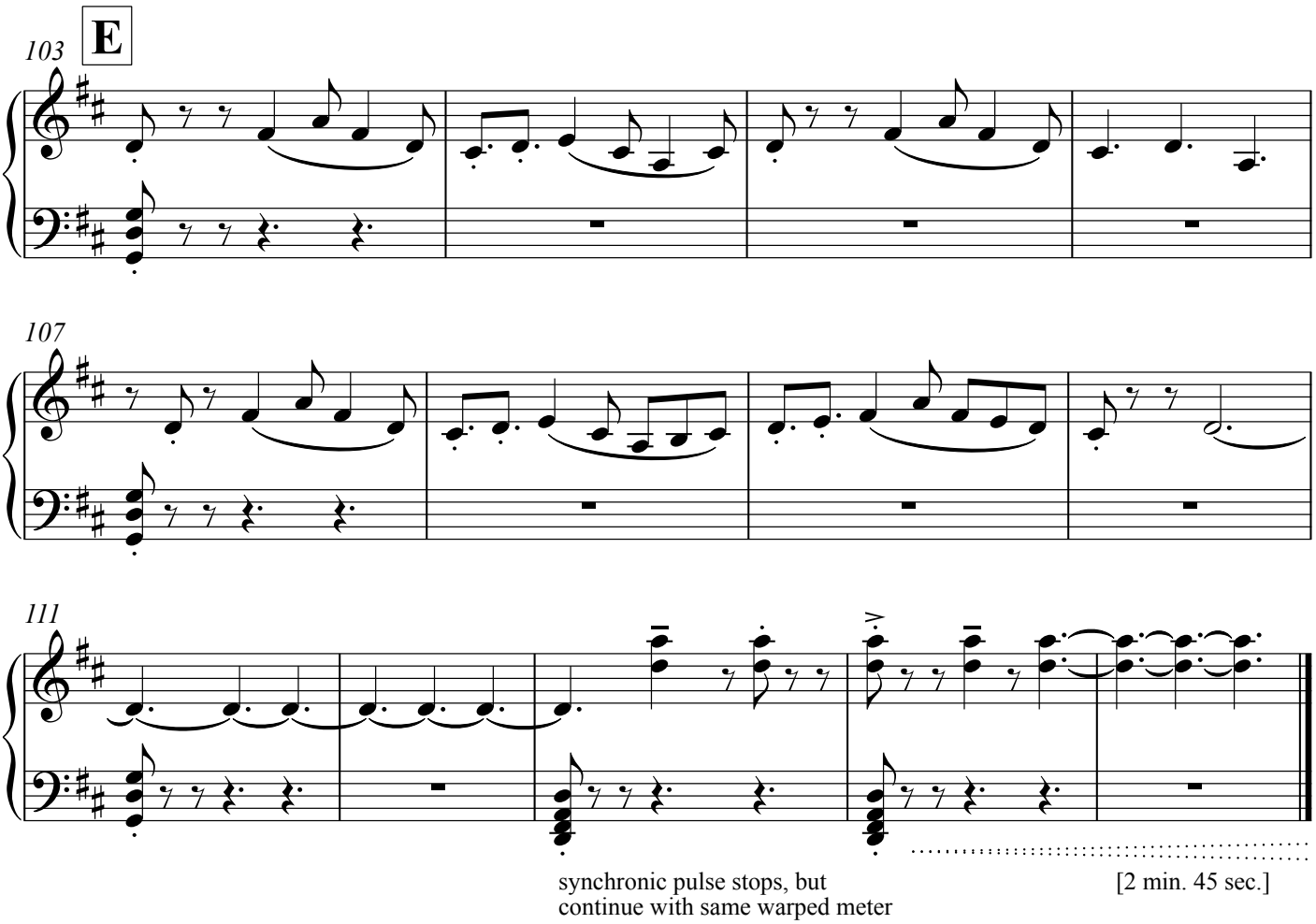



A
19
23
27
32
B
36


40
44
48
52
56
C

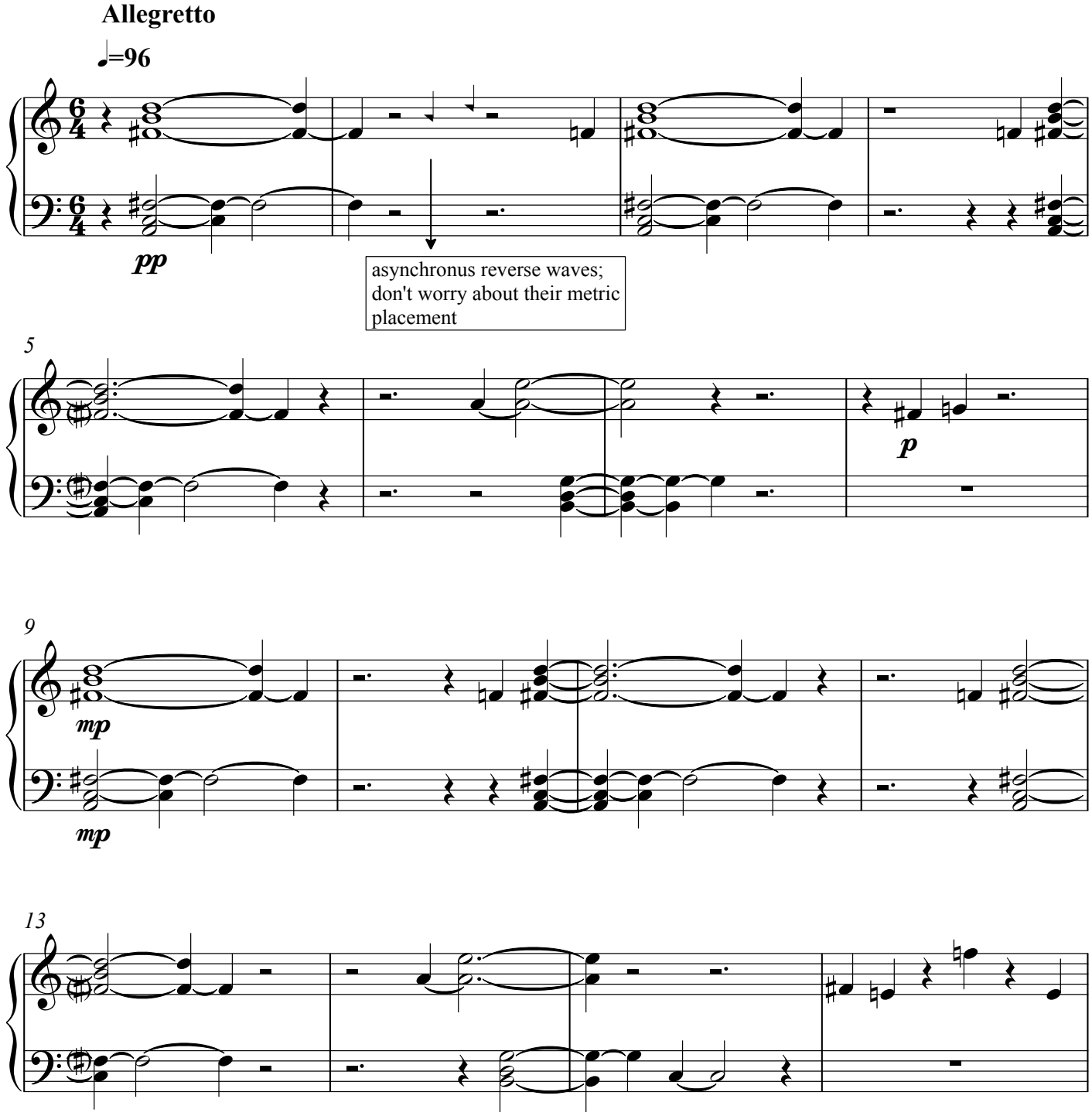

61
65
69
73
78
D

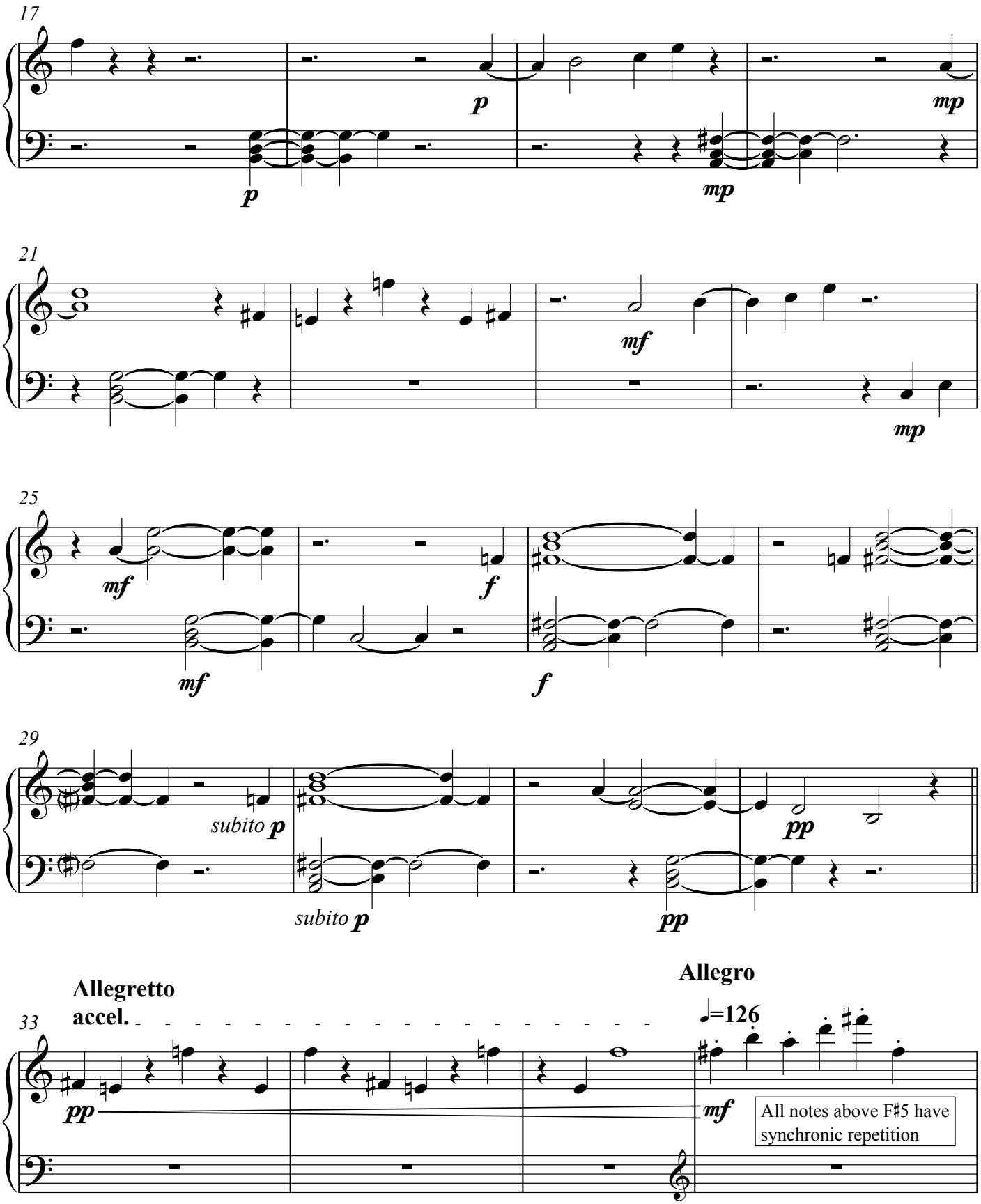

82
86
90
94
98

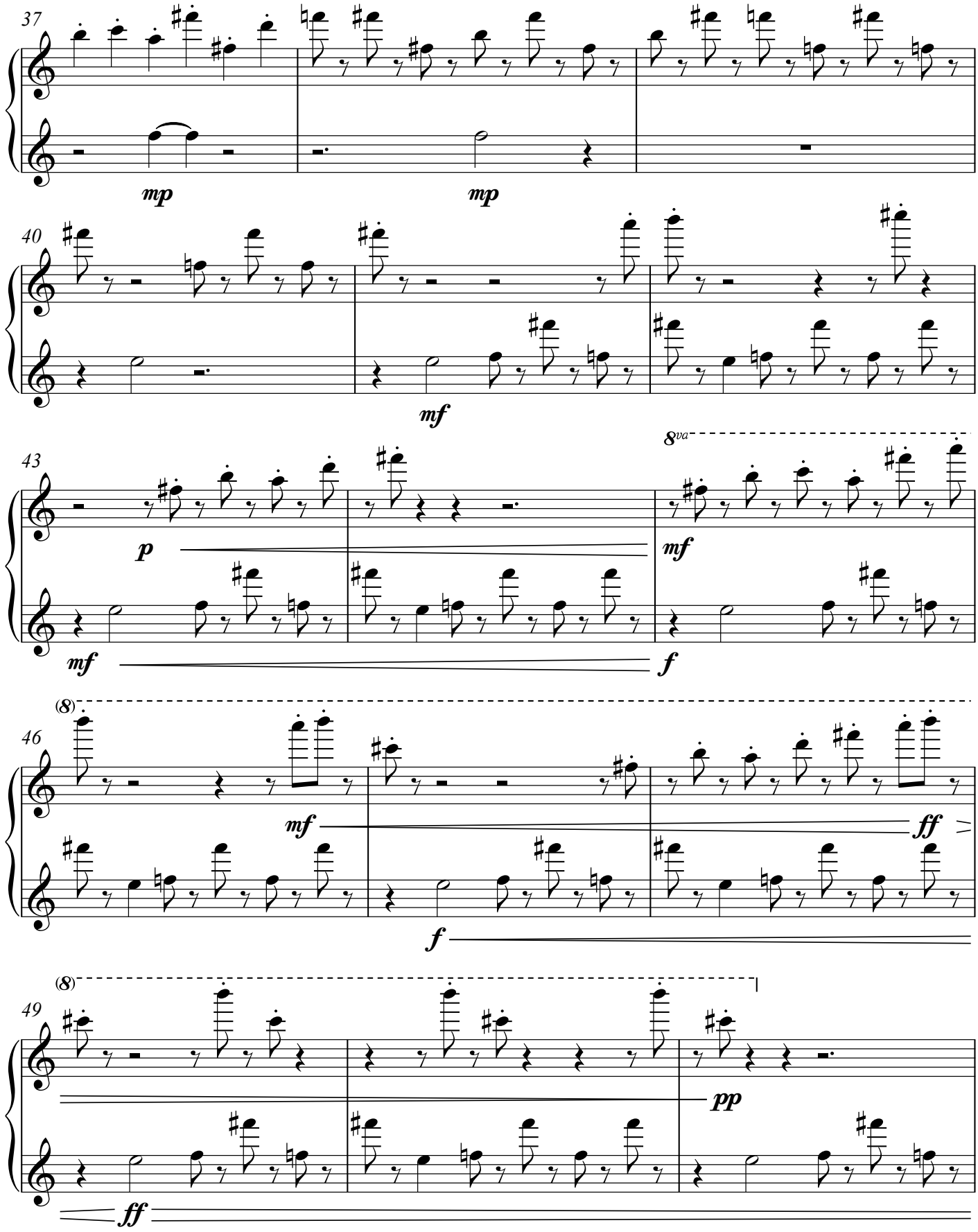

103
E
107
111
synchronic pulse stops, but
continue with same warped meter
[2 min. 45 sec.]

Juxtaposed Weather

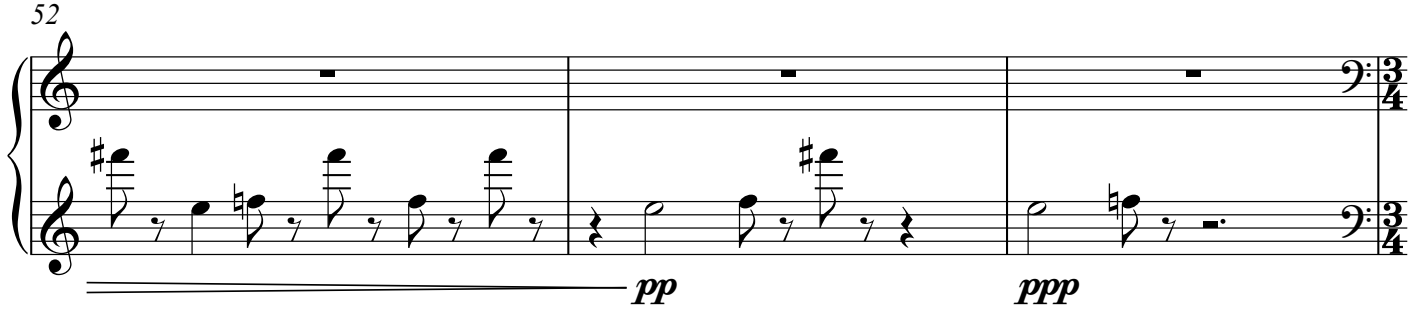
Louise Fristensky




17
p
p
mp
mp
21
mf
mp
25
mf
mf
f
f
29
subito p
subito p
pp
pp
Allegretto
accel.
33
Allegro
♩=126
pp
mf
All notes above F♯5 have synchronic repetition


37
mp
mp
40
mf
43
8va
p
mf
mf
f
(8)
46
mf
ff
f
(8)
49
pp
ff

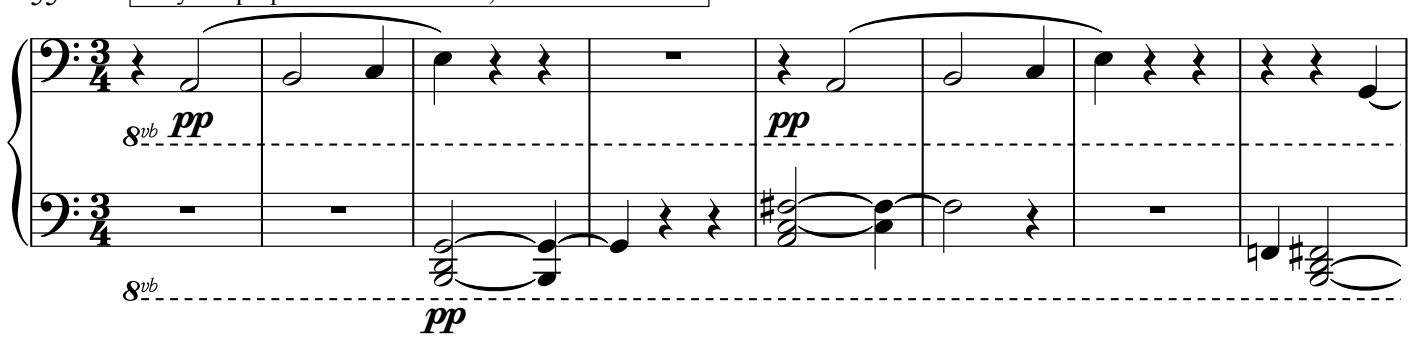
52



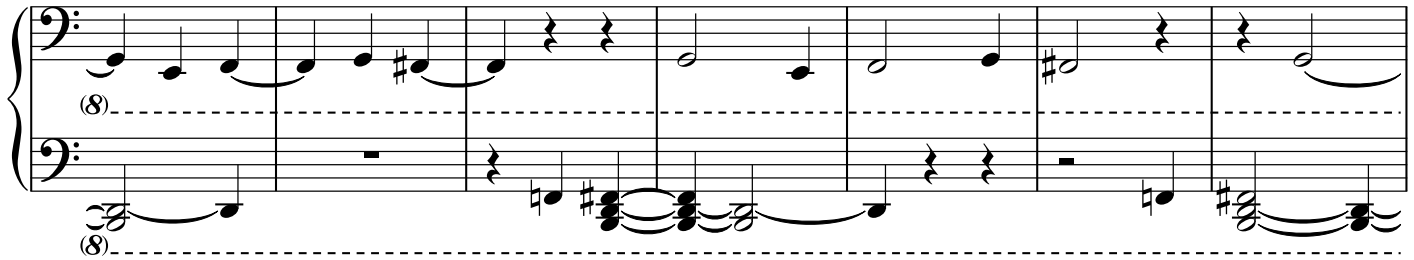
Largo

♩=47

55 Only the preparations will sound, not the note struck



63



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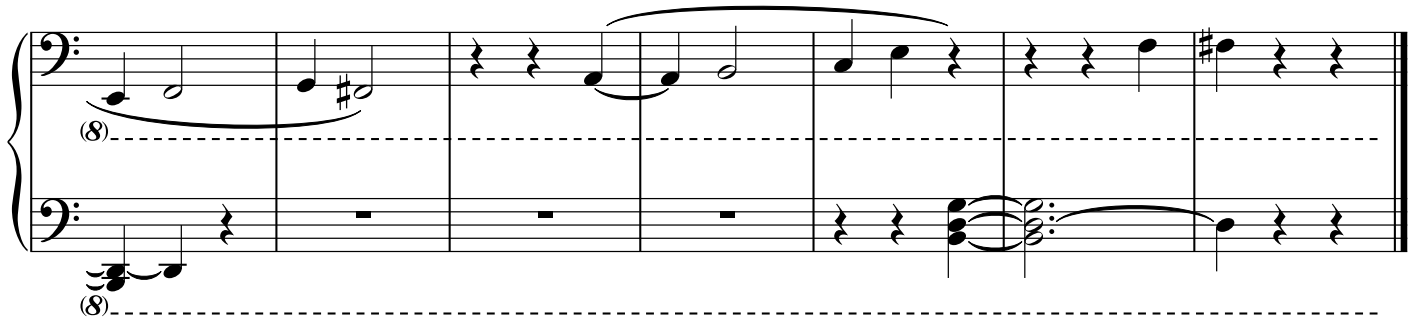
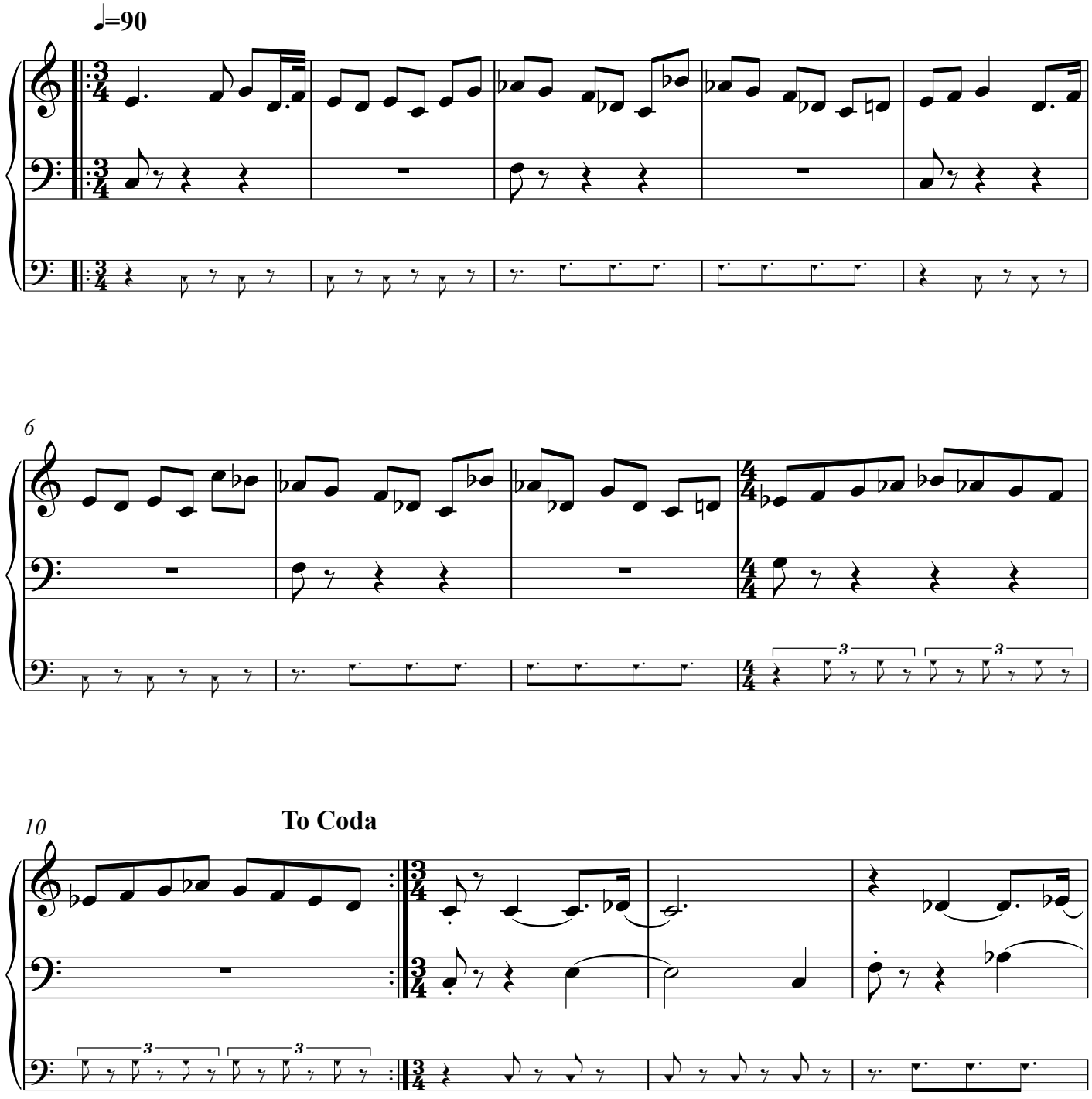


[4 min. 28 sec.]

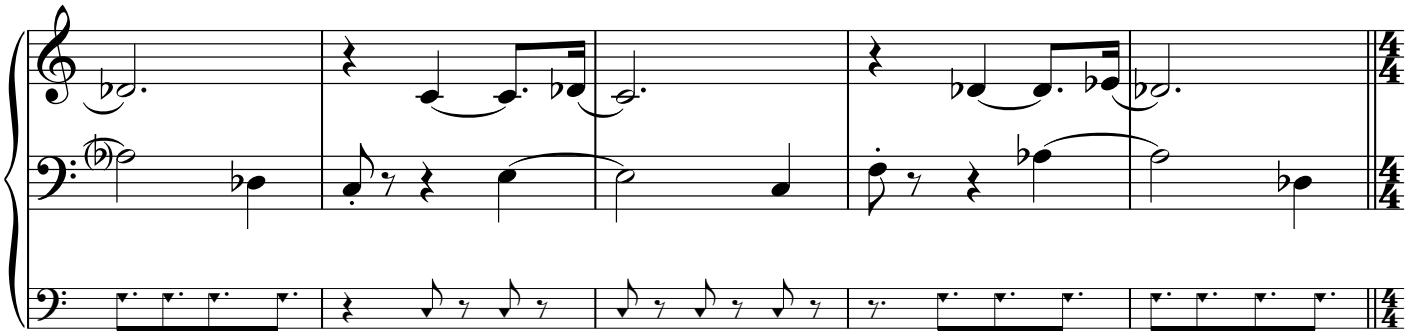
Keep It Steady

Dan Trueman

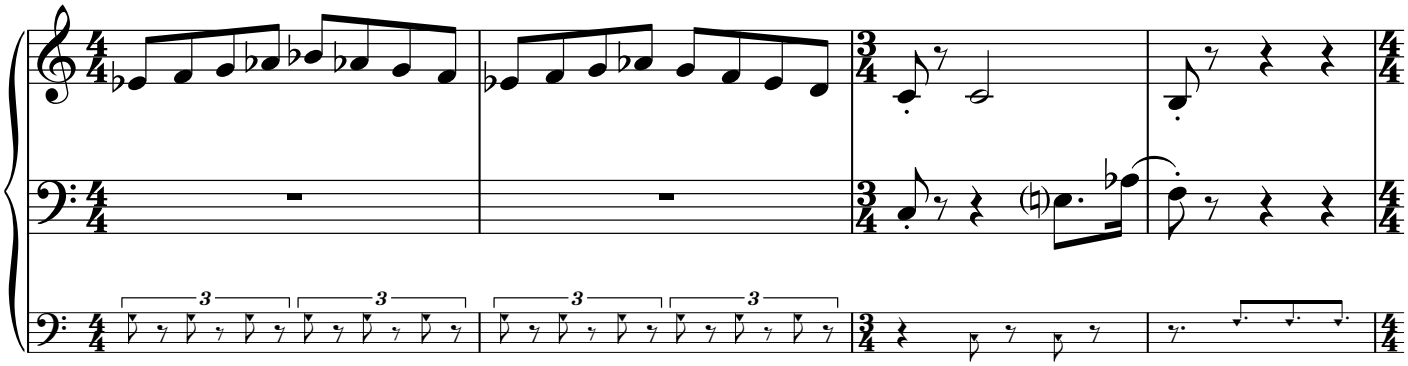


14

D.C. al Coda



19 **CODA**



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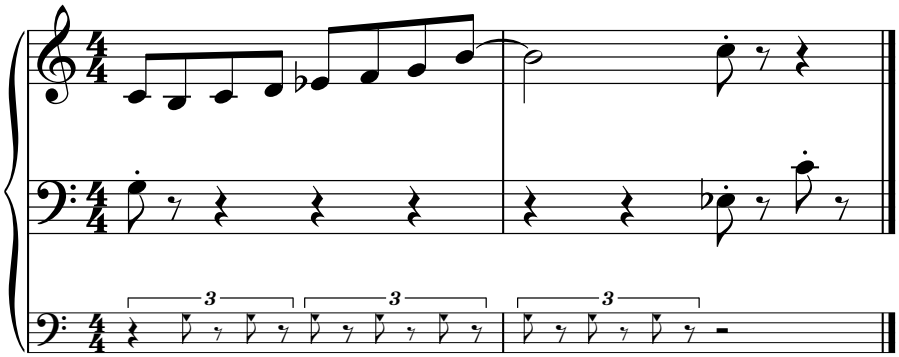
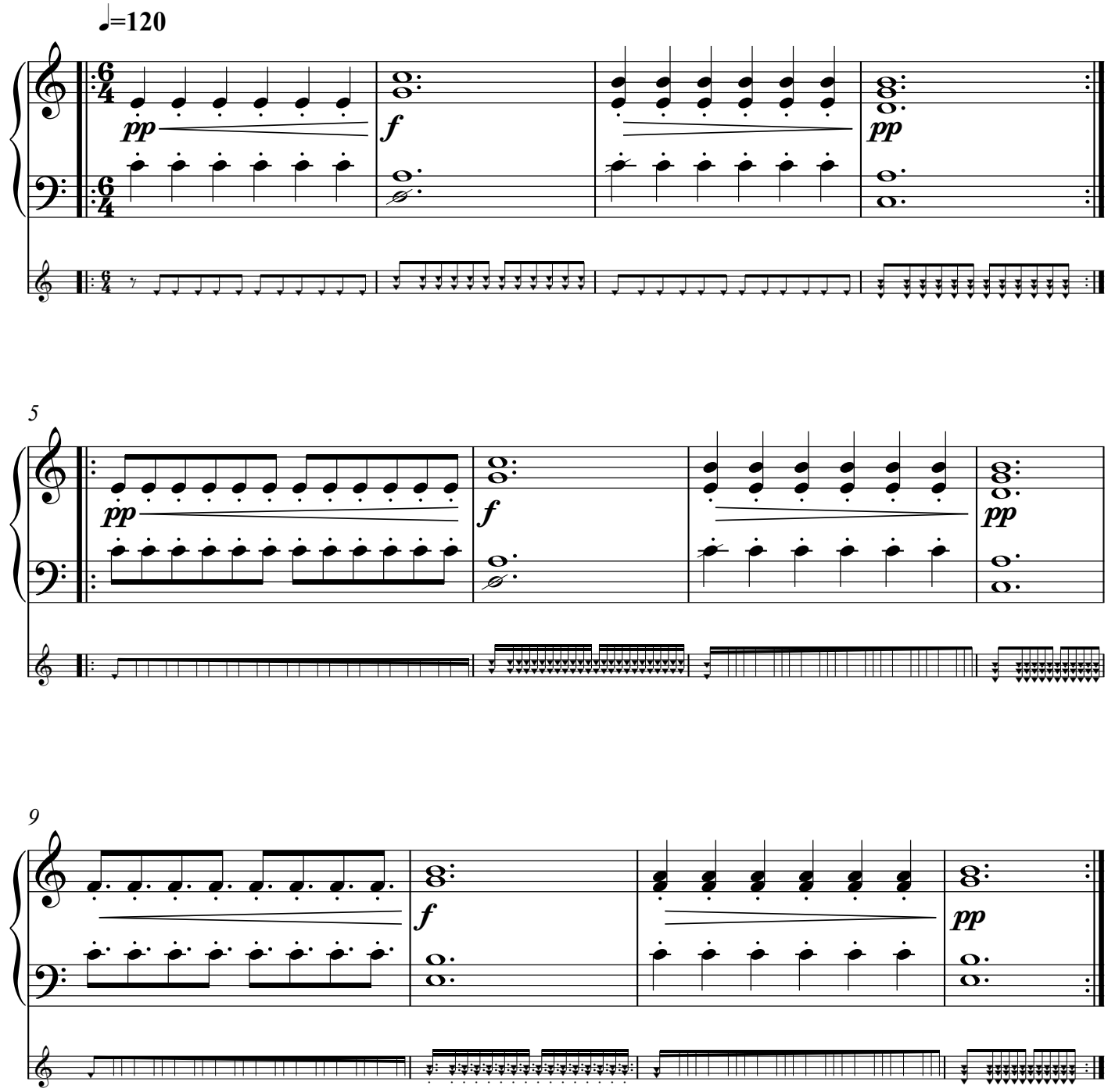


[1 min. 35 sec.]

Keep It Steady (or not)

Dan Trueman



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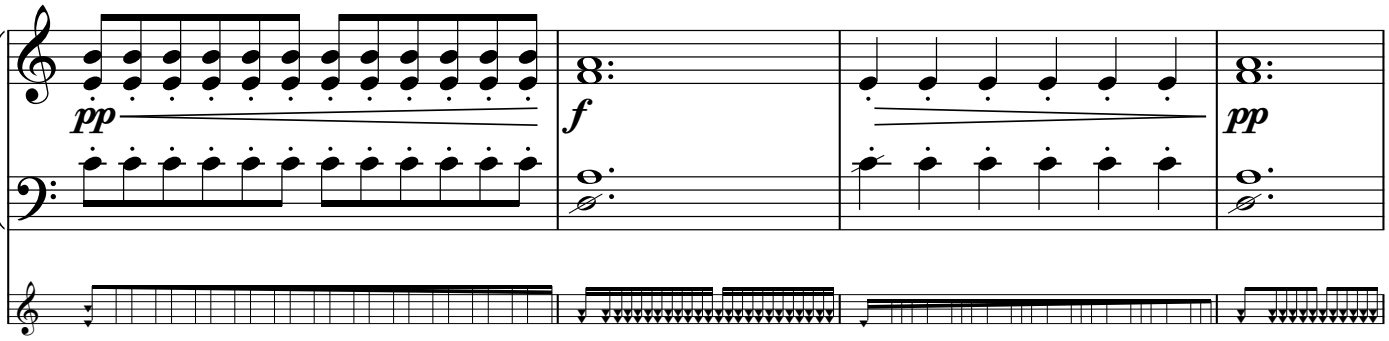

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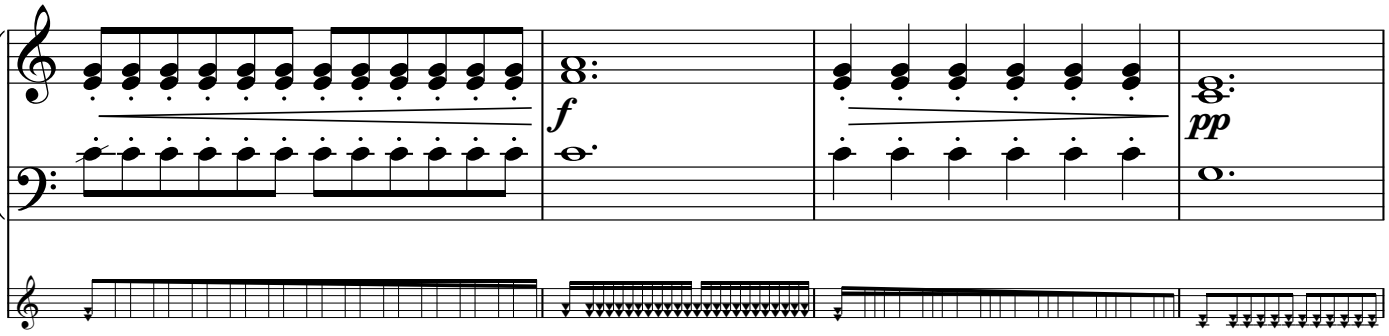
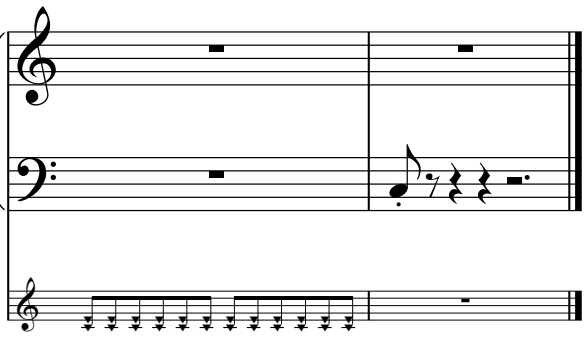


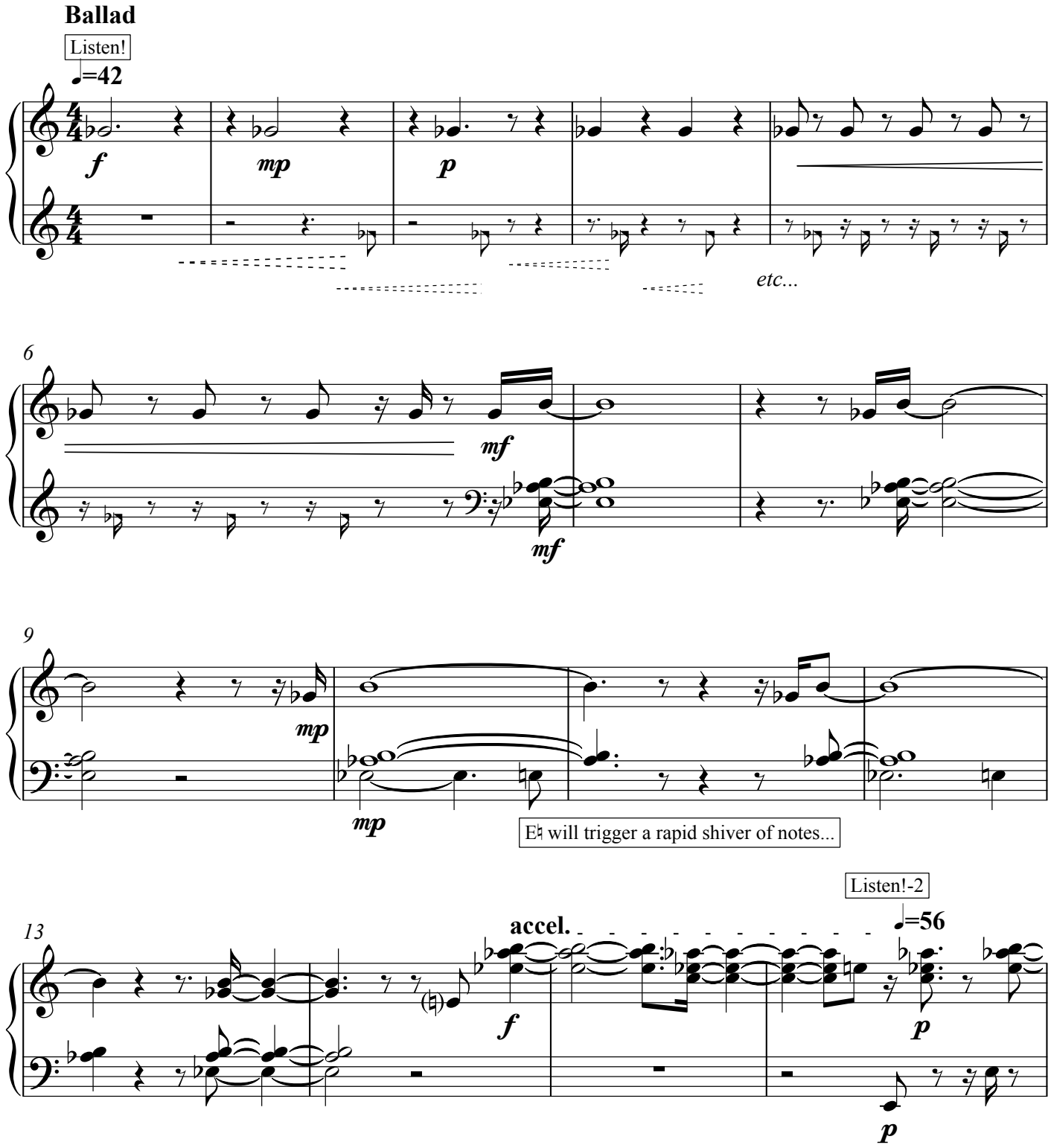
21

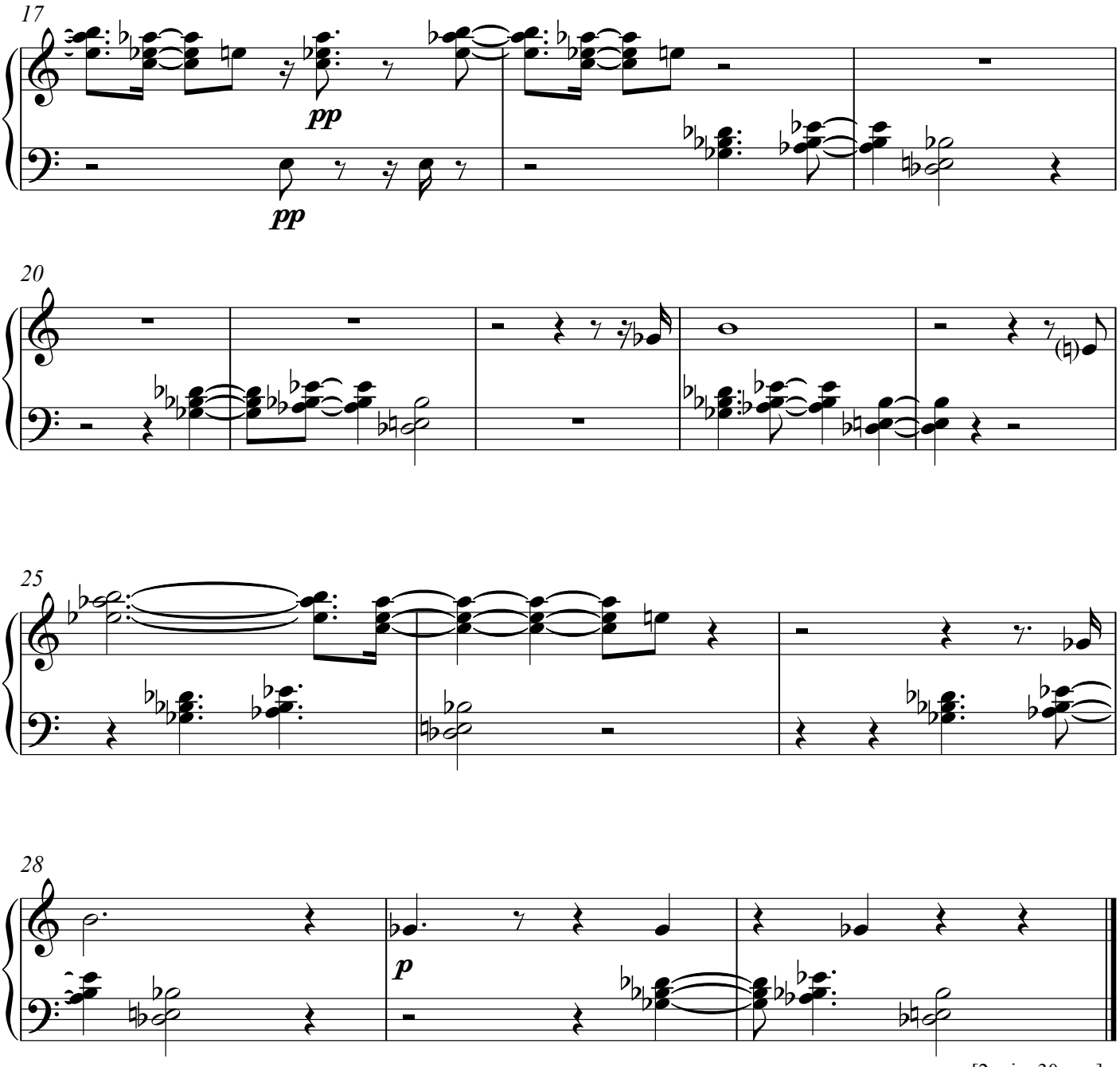


[1 min. 42 sec.]

Listen!

Louise Fristensky

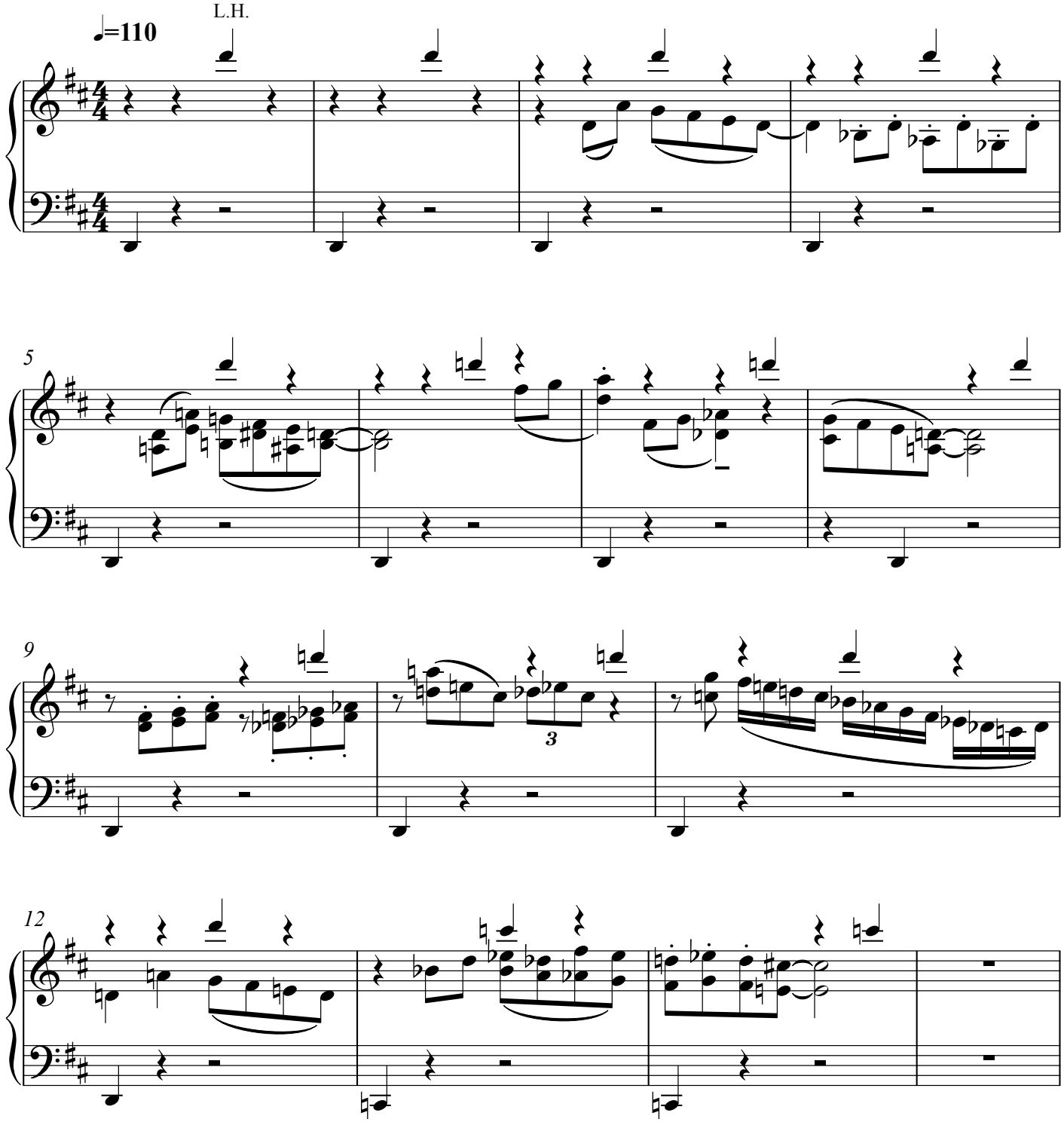


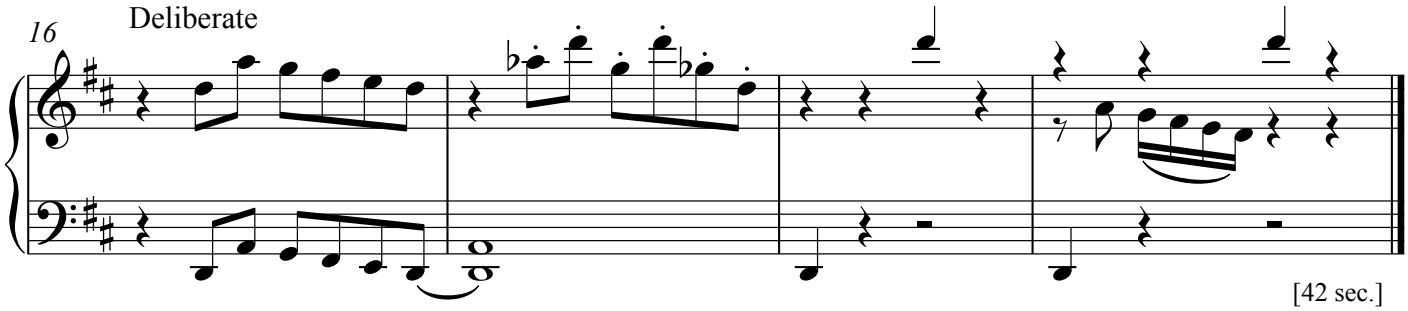


[2 min. 30 sec.]

Mama's Musette

Jennifer Trueman

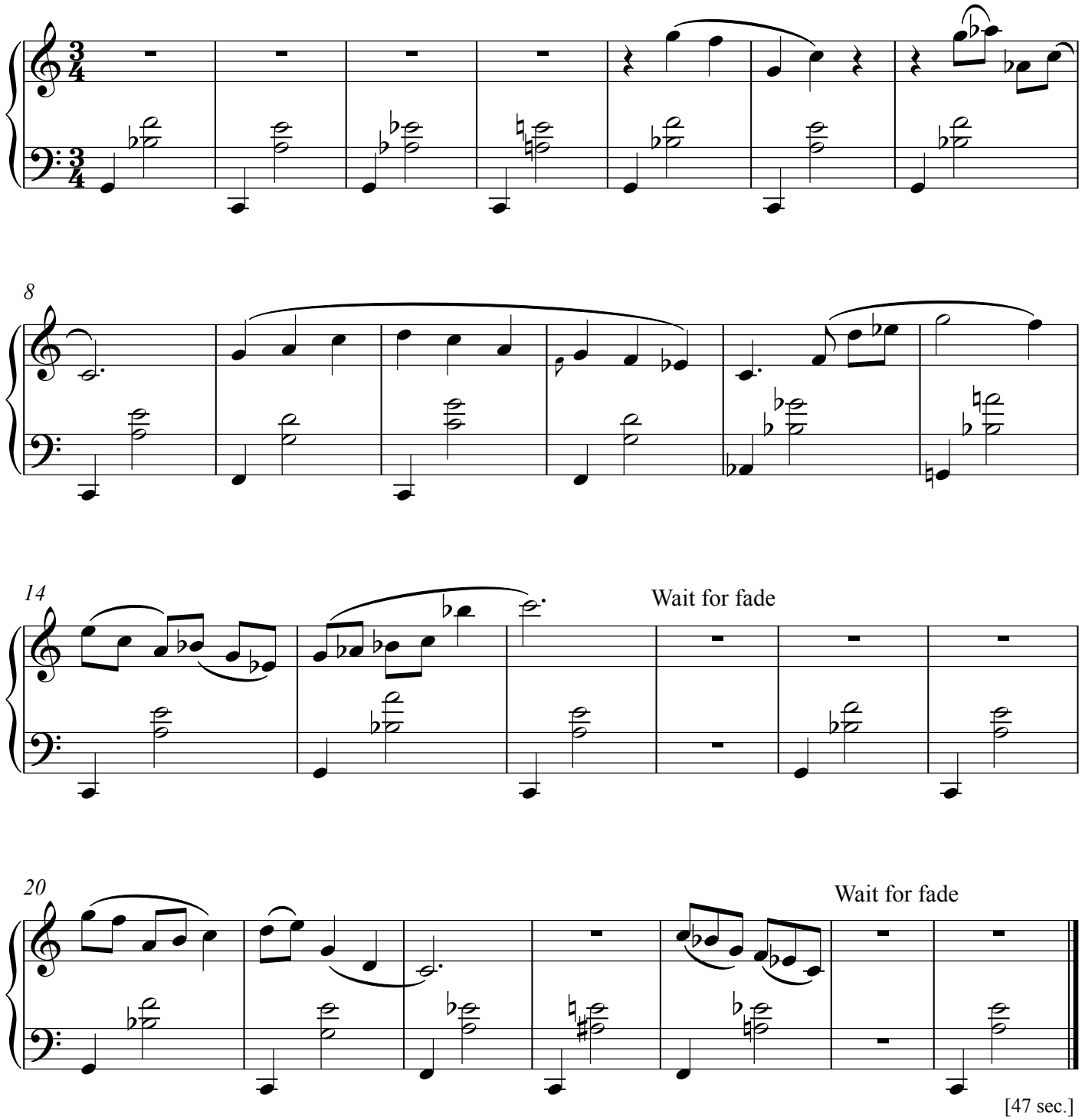




[42 sec.]

Petite Gymnopedie

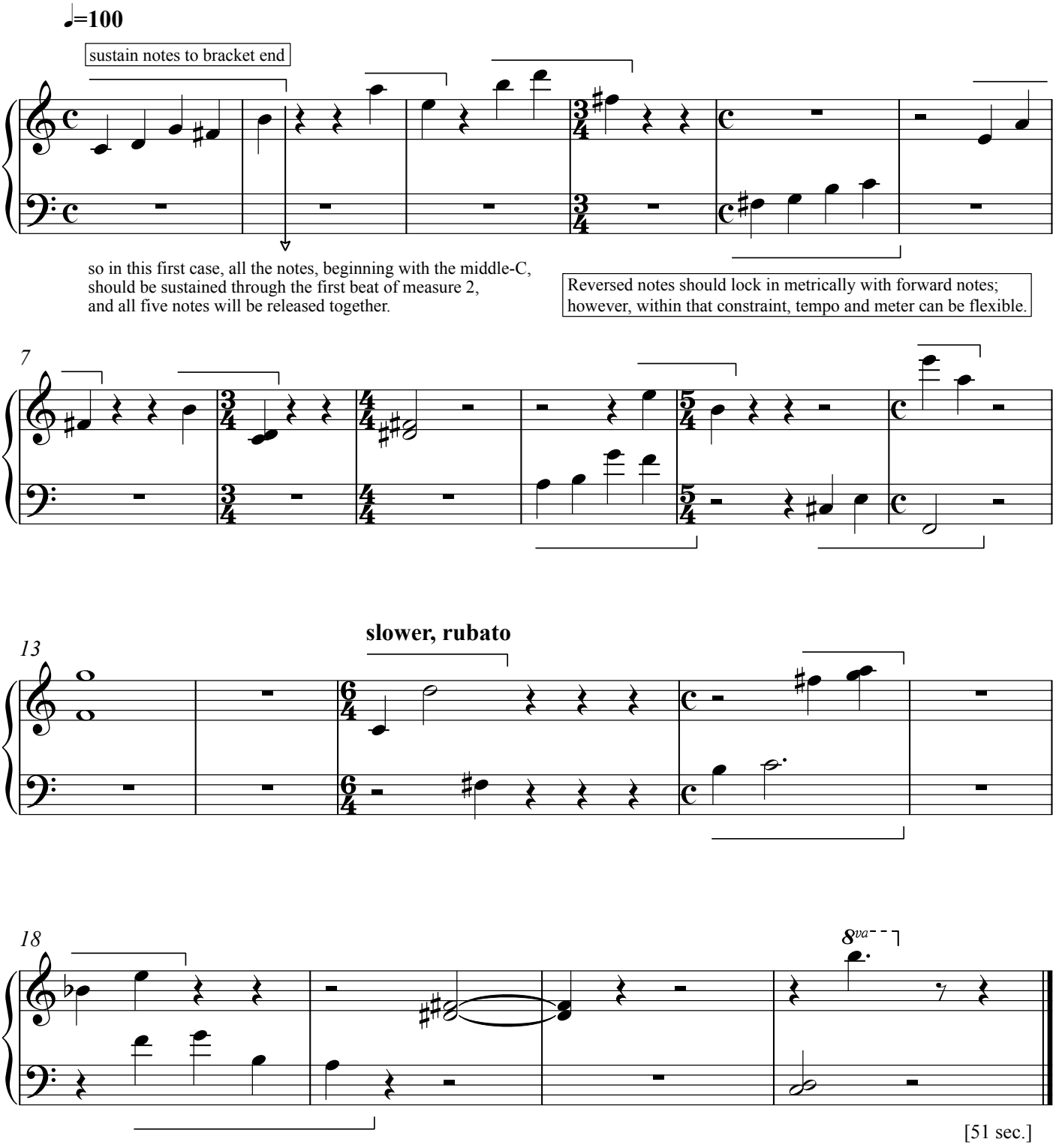
Jennifer Trueman



[47 sec.]

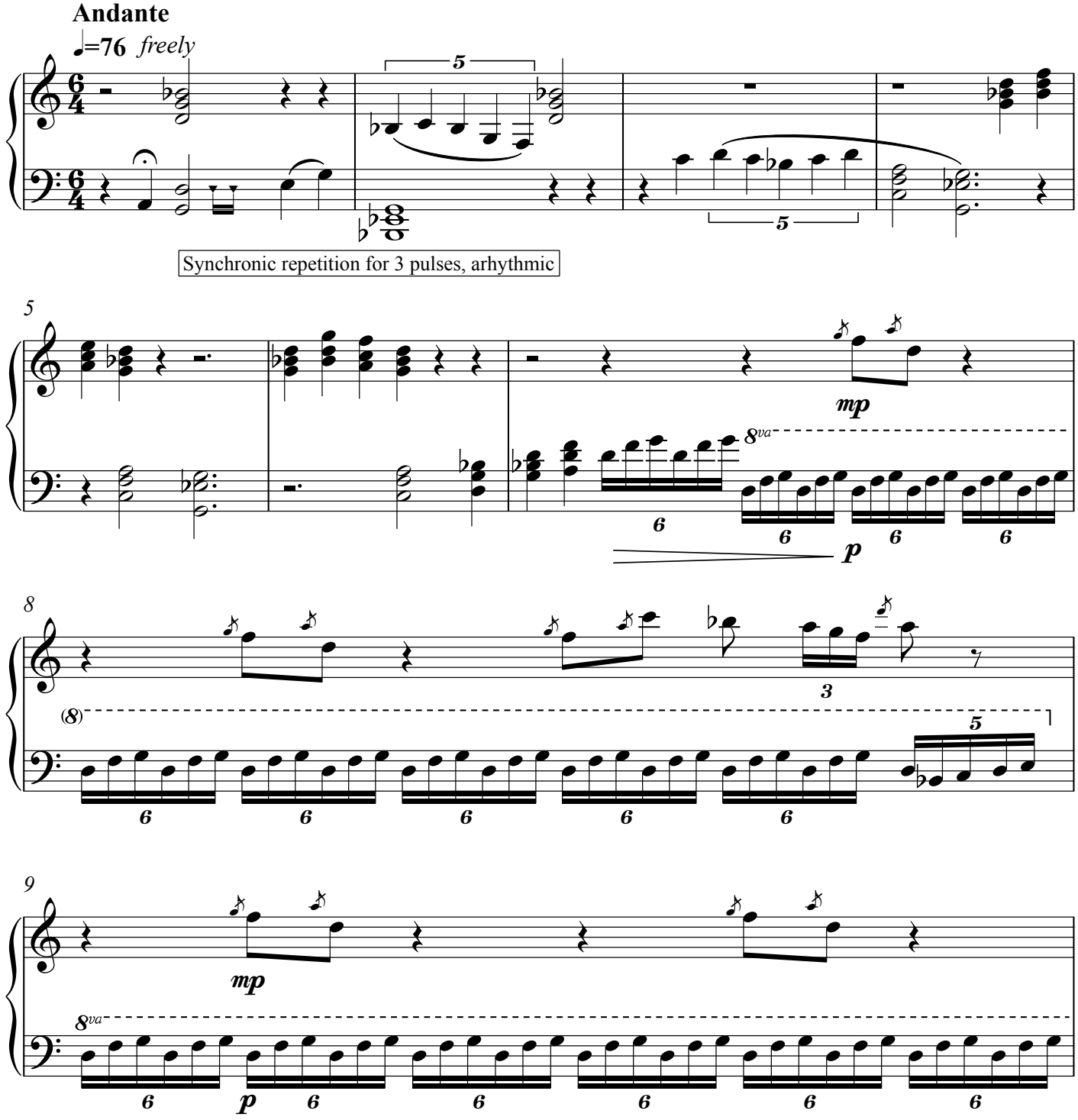
Pyramids

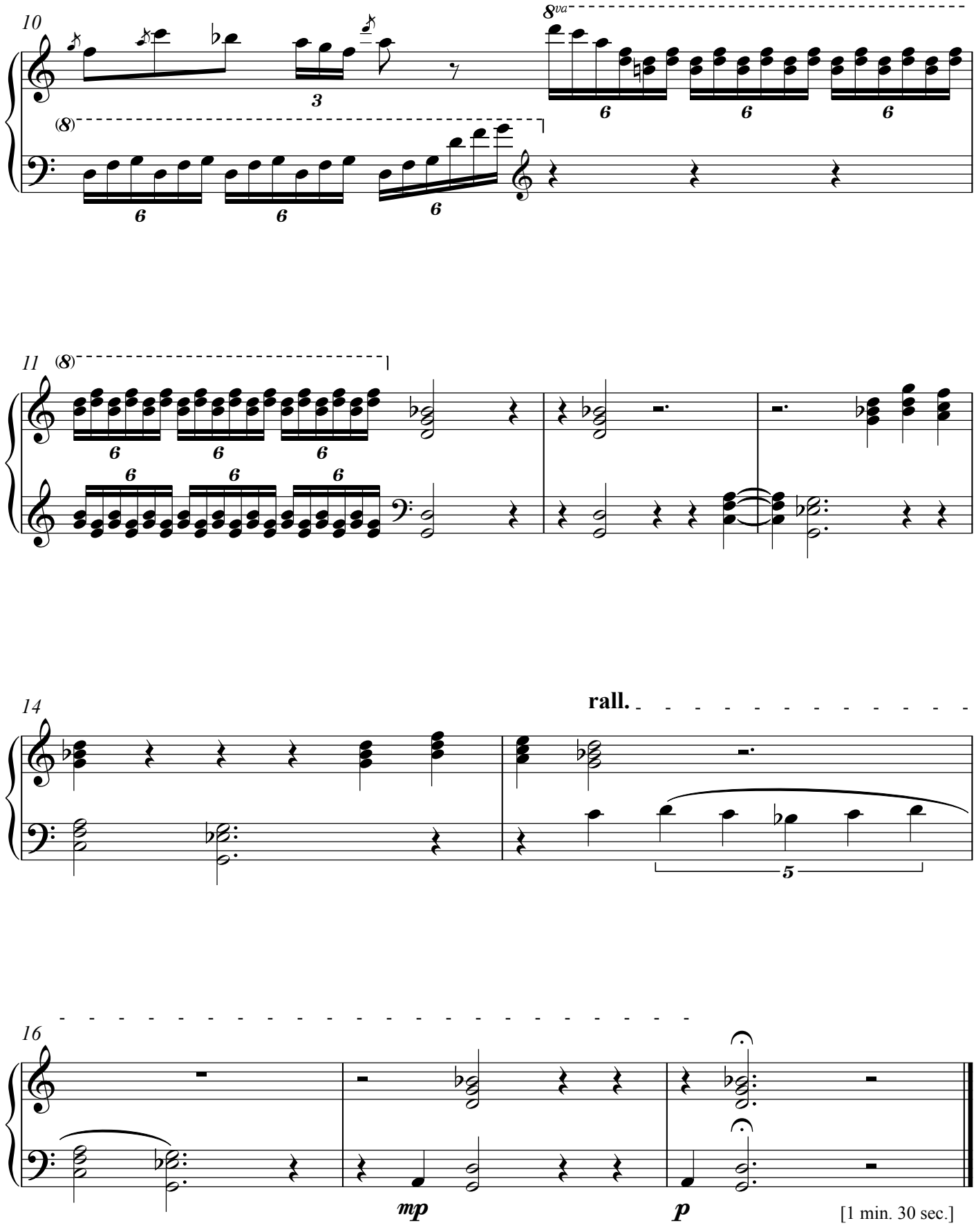
Caitlin Cawley and Nick Joliat



Quickie

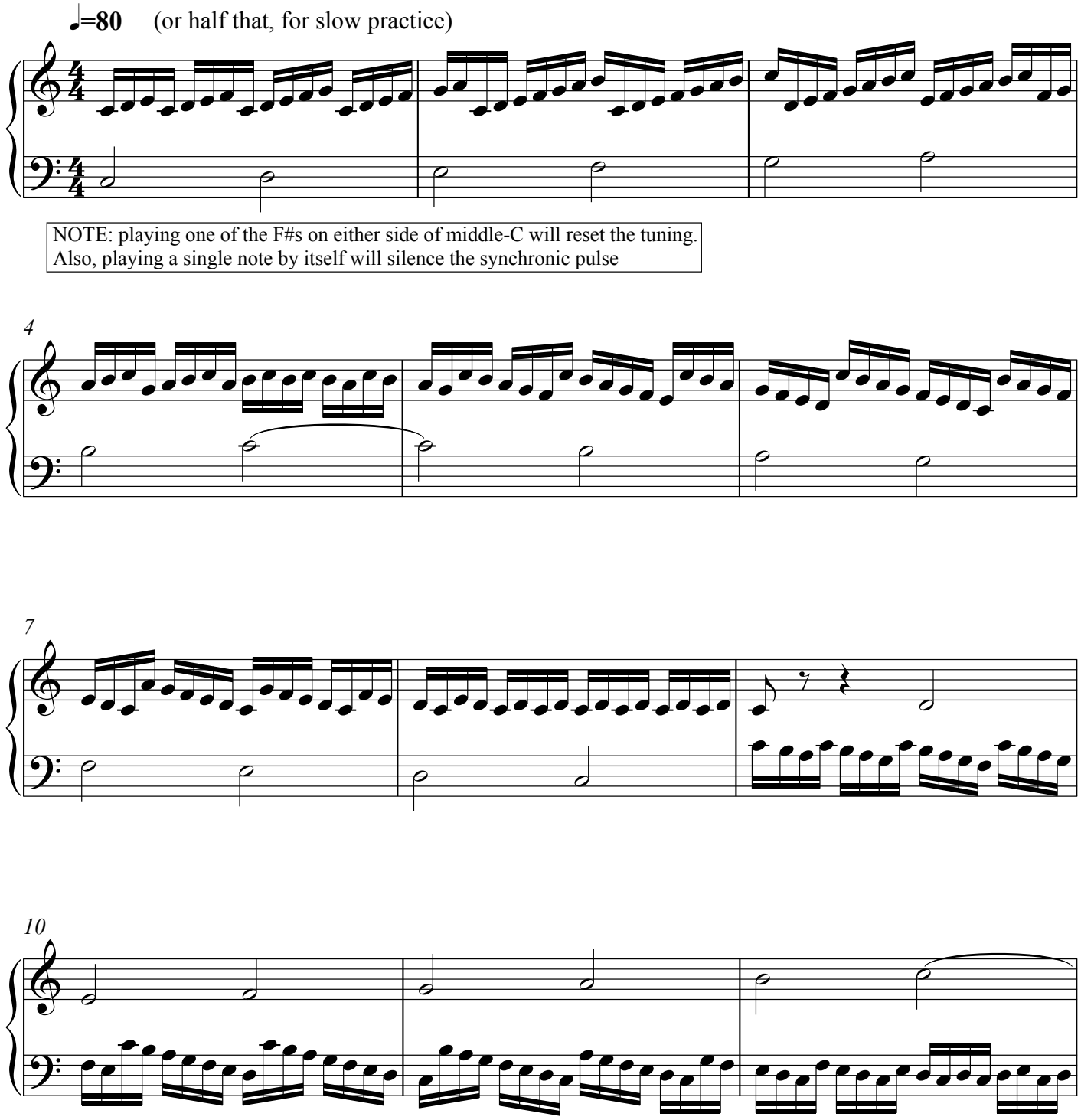
Louise Fristensky

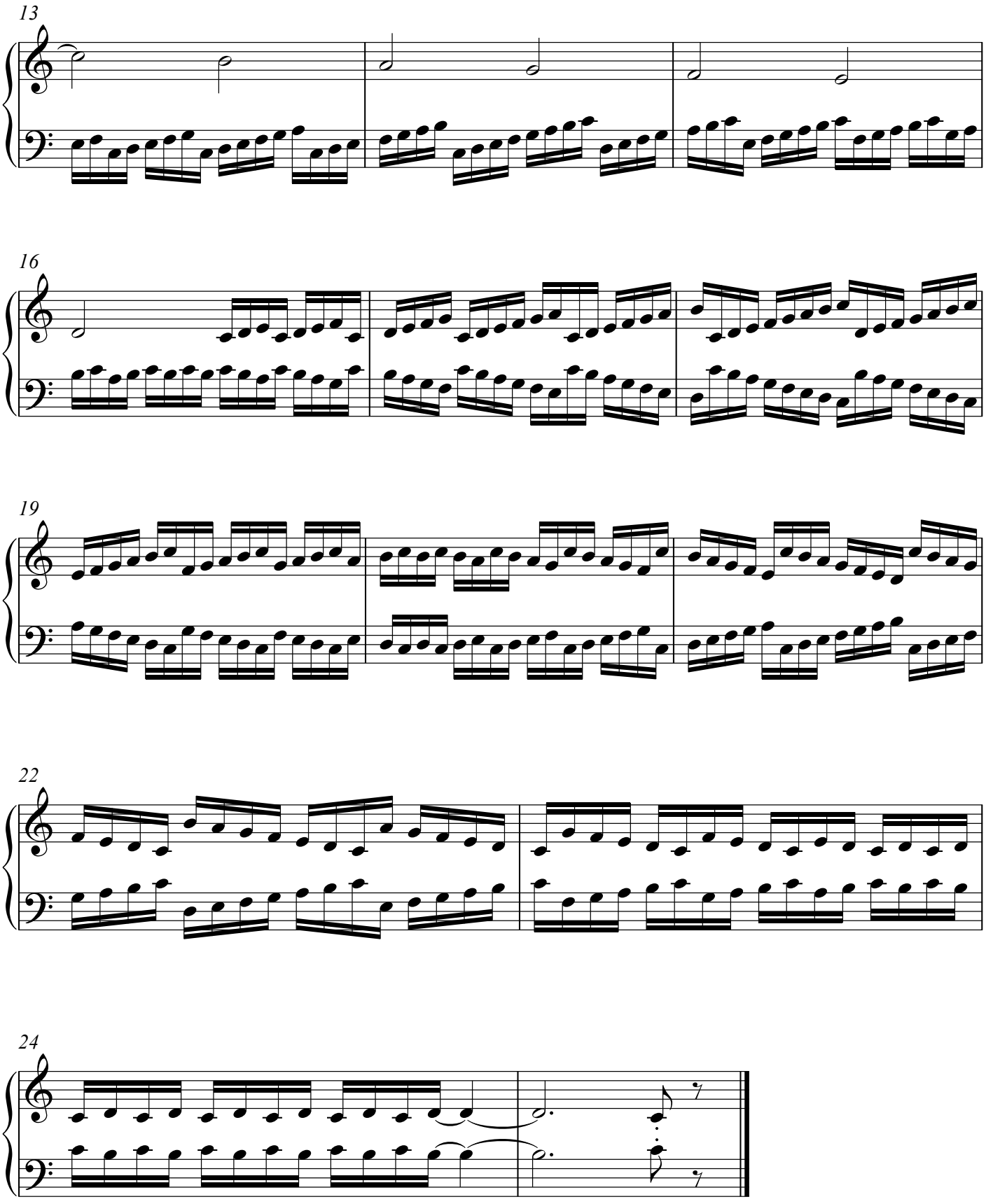



10
8va
(8)
3
6
6
6
6
11
(8)
6
6
6
6
6
6
14
rall.
5
16
mp
p
[1 min. 30 sec.]

Scales within Sliding Scales

Dan Trueman

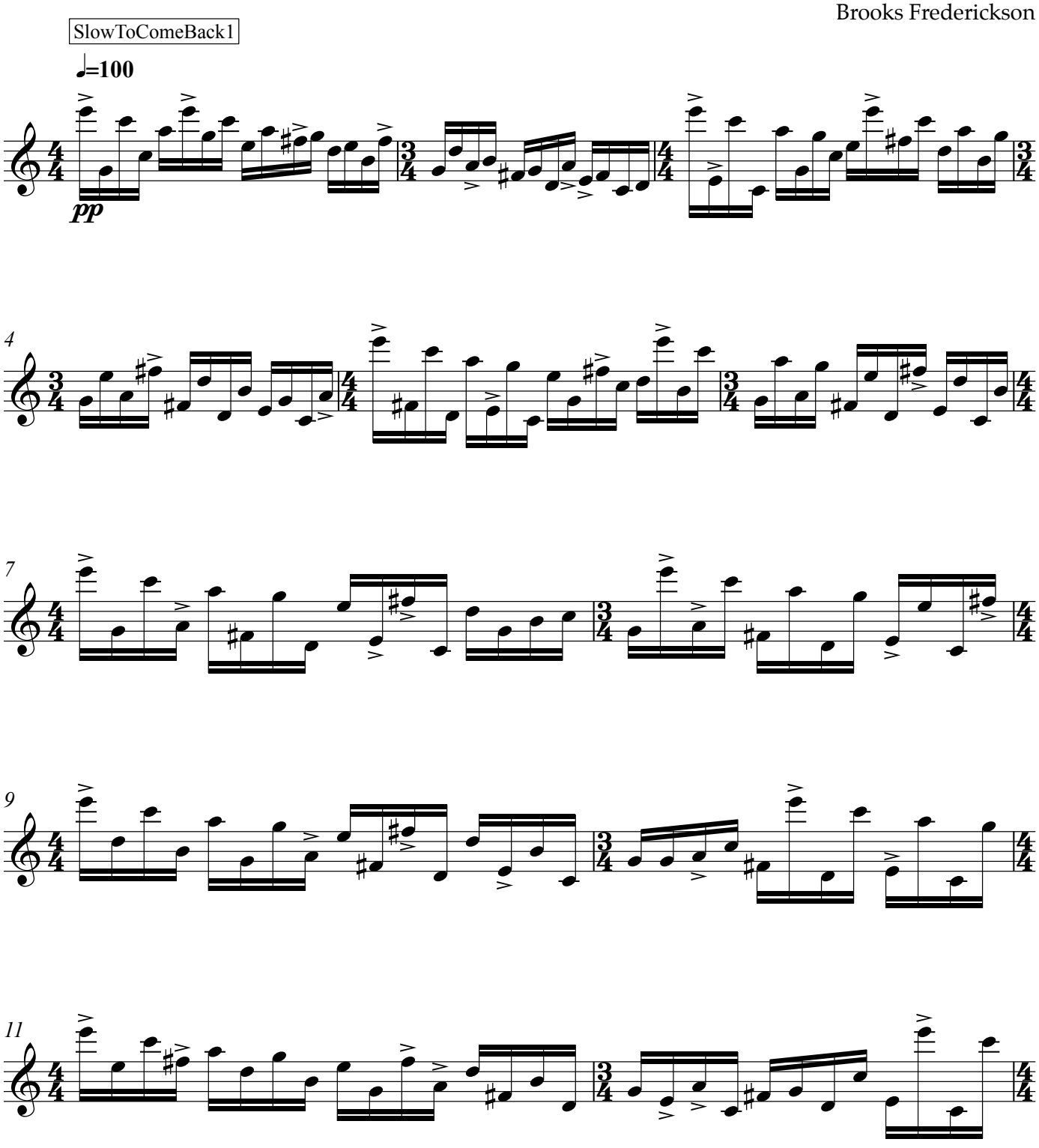


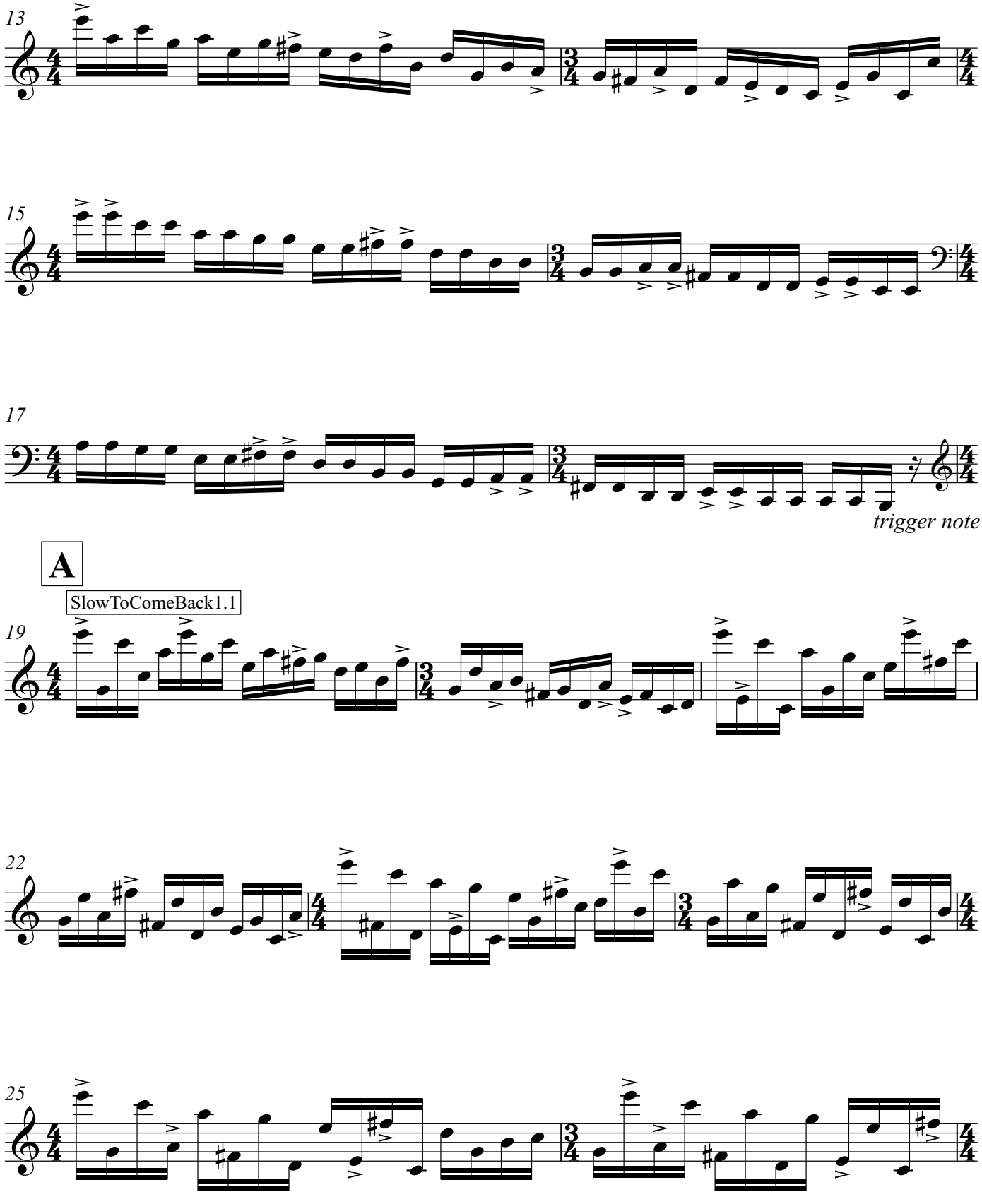


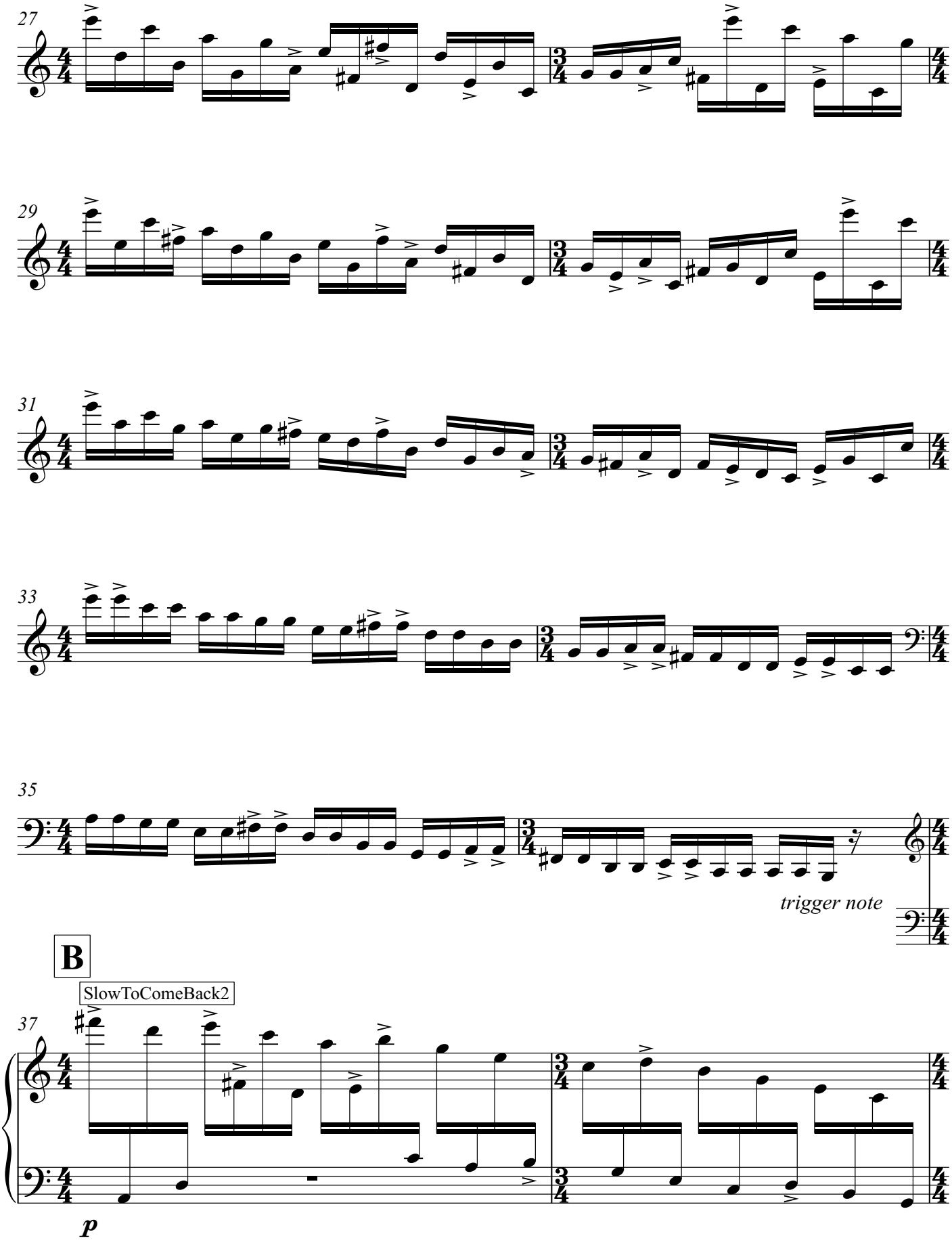
[1 min. 15 sec.]

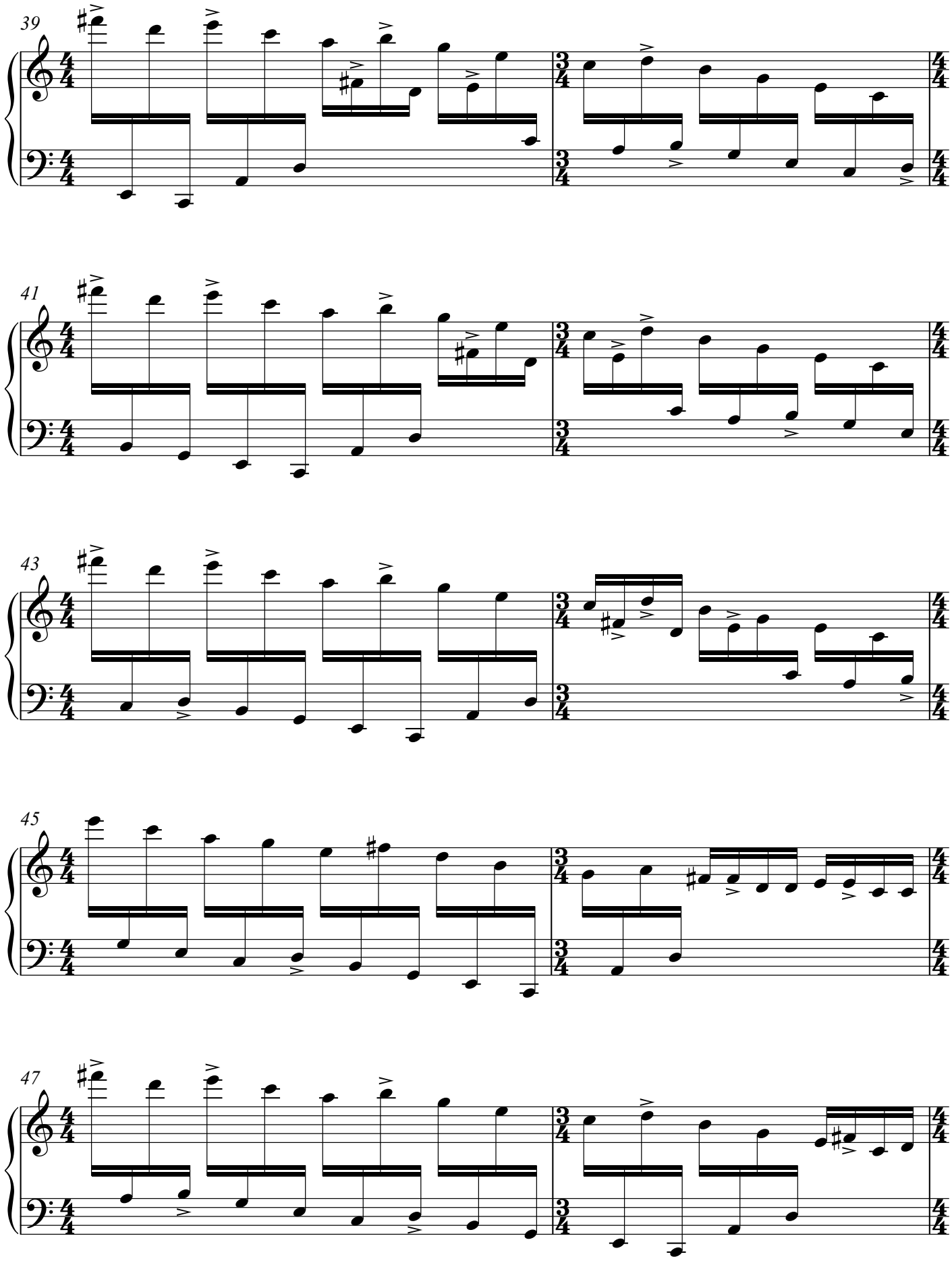
Slow To Come Back

Brooks Frederickson




13
15
17
trigger note
A
SlowToComeBack1.1
19
22
25


27
29
31
33
35
trigger note
B
SlowToComeBack2
37
p

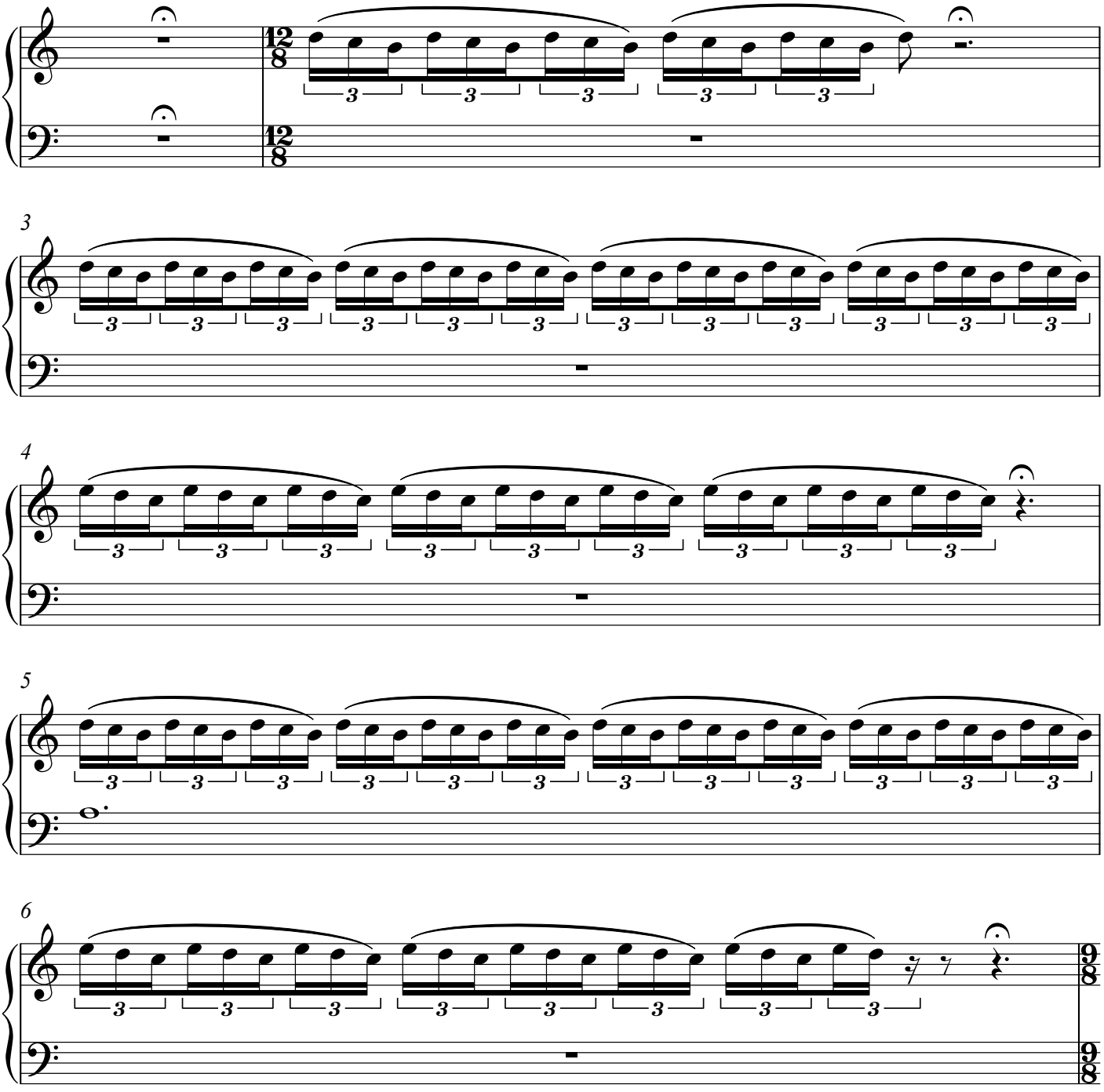

39
41
43
45
47

[1 min. 52 sec.]

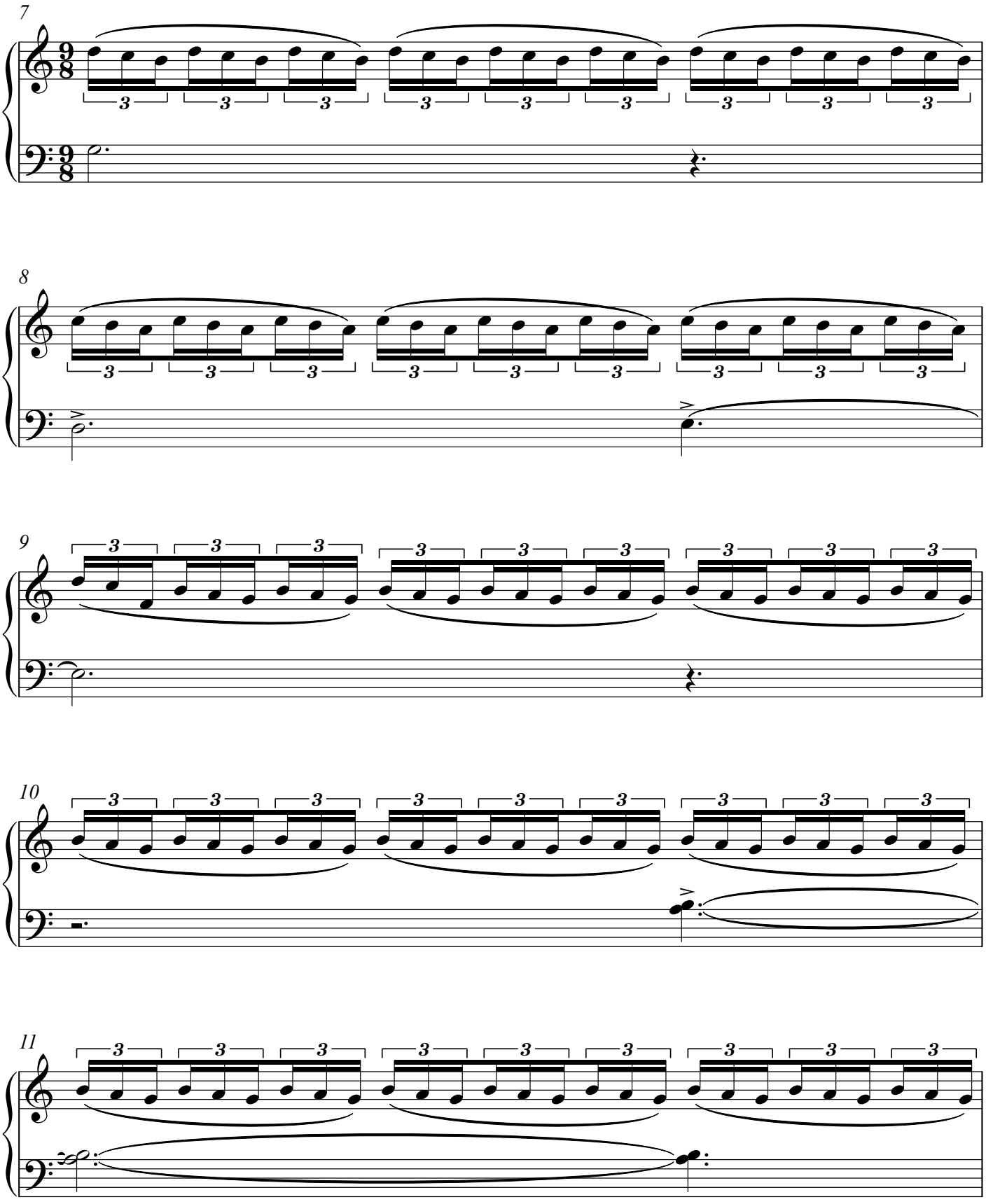
Southwing

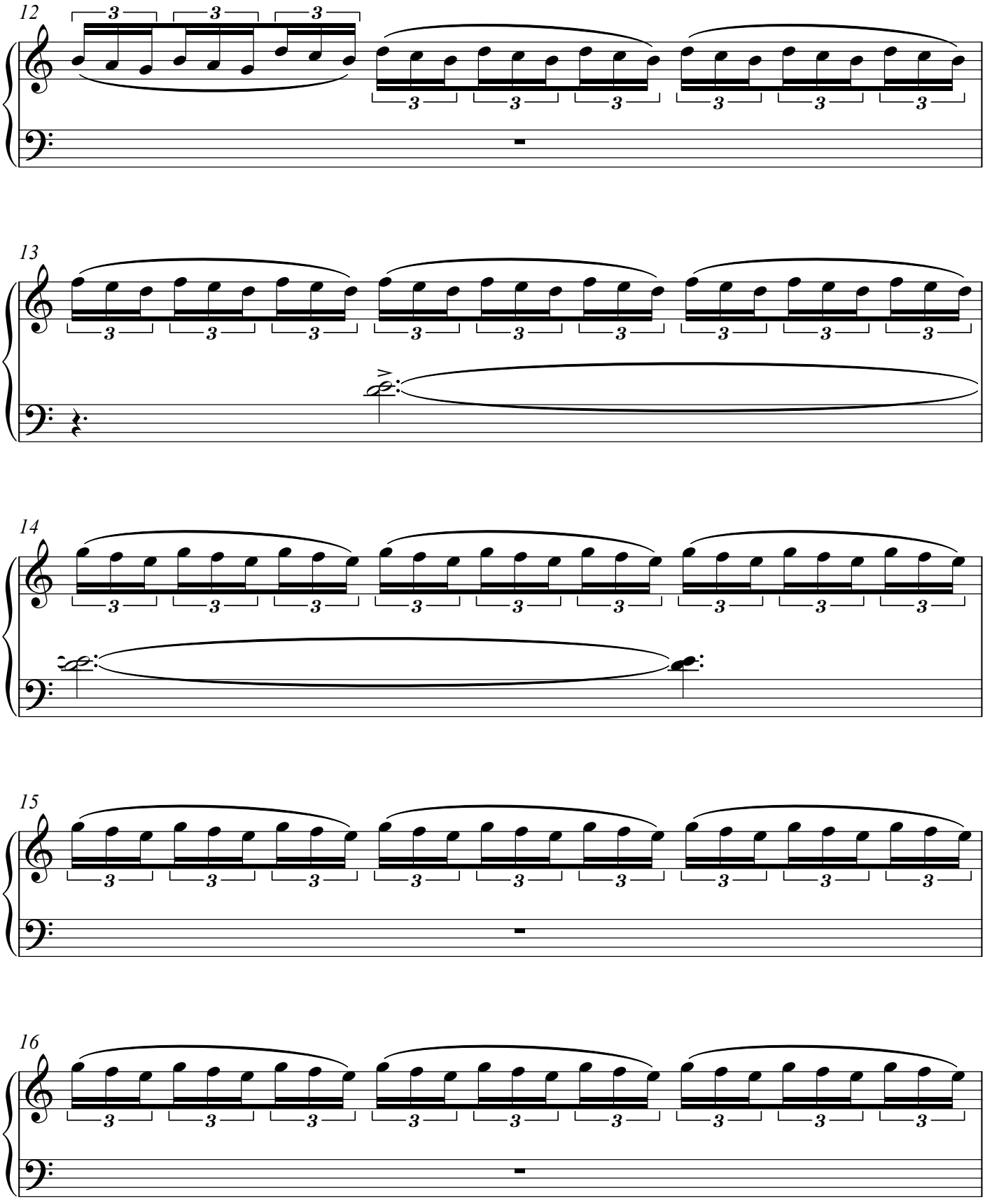
Lainie Fefferman

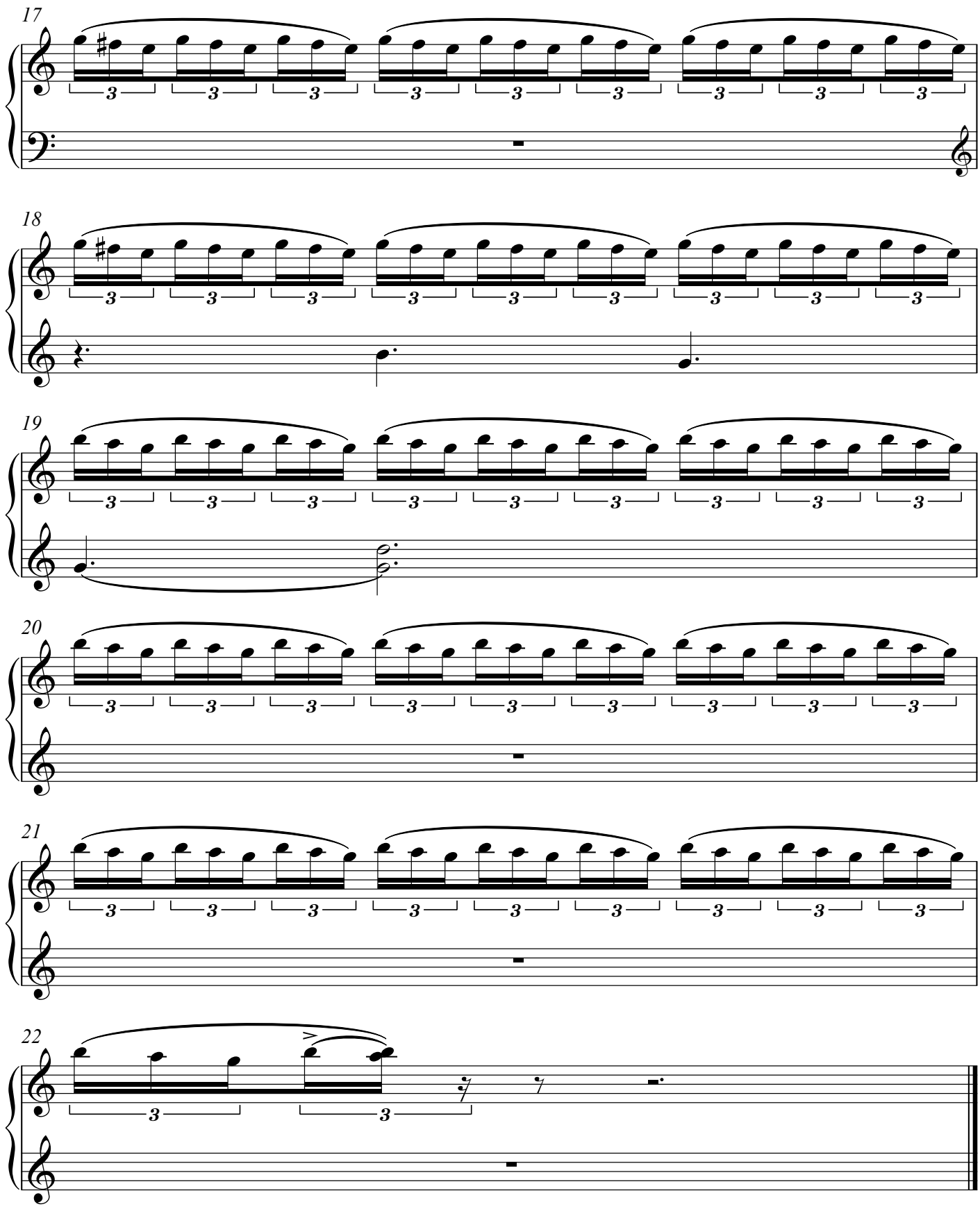
Tempo can be fluid
Hover around ♩. = 60



Pause until
low A is
inaudible


7
8
9
10
11


12
13
14
15
16

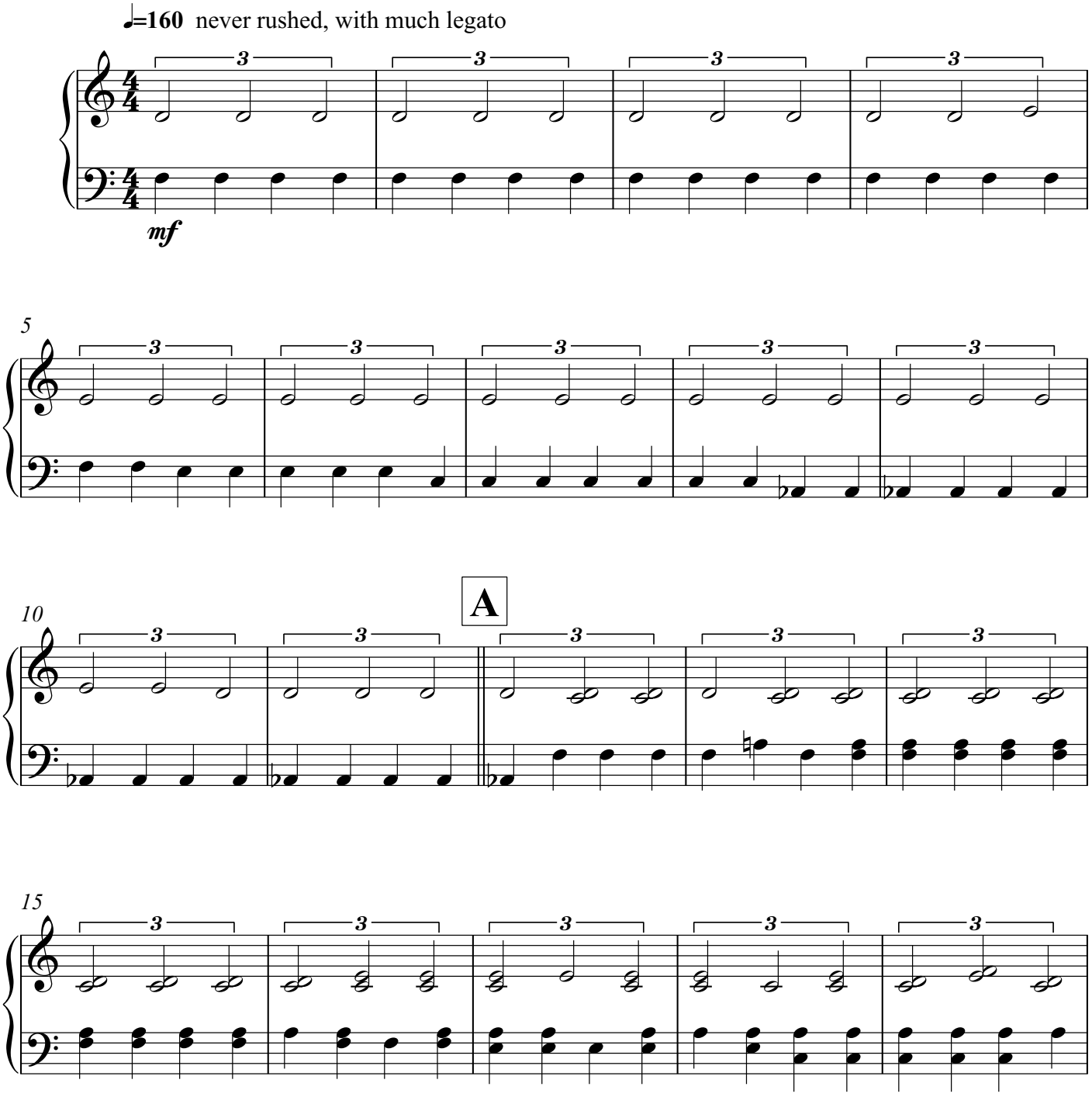


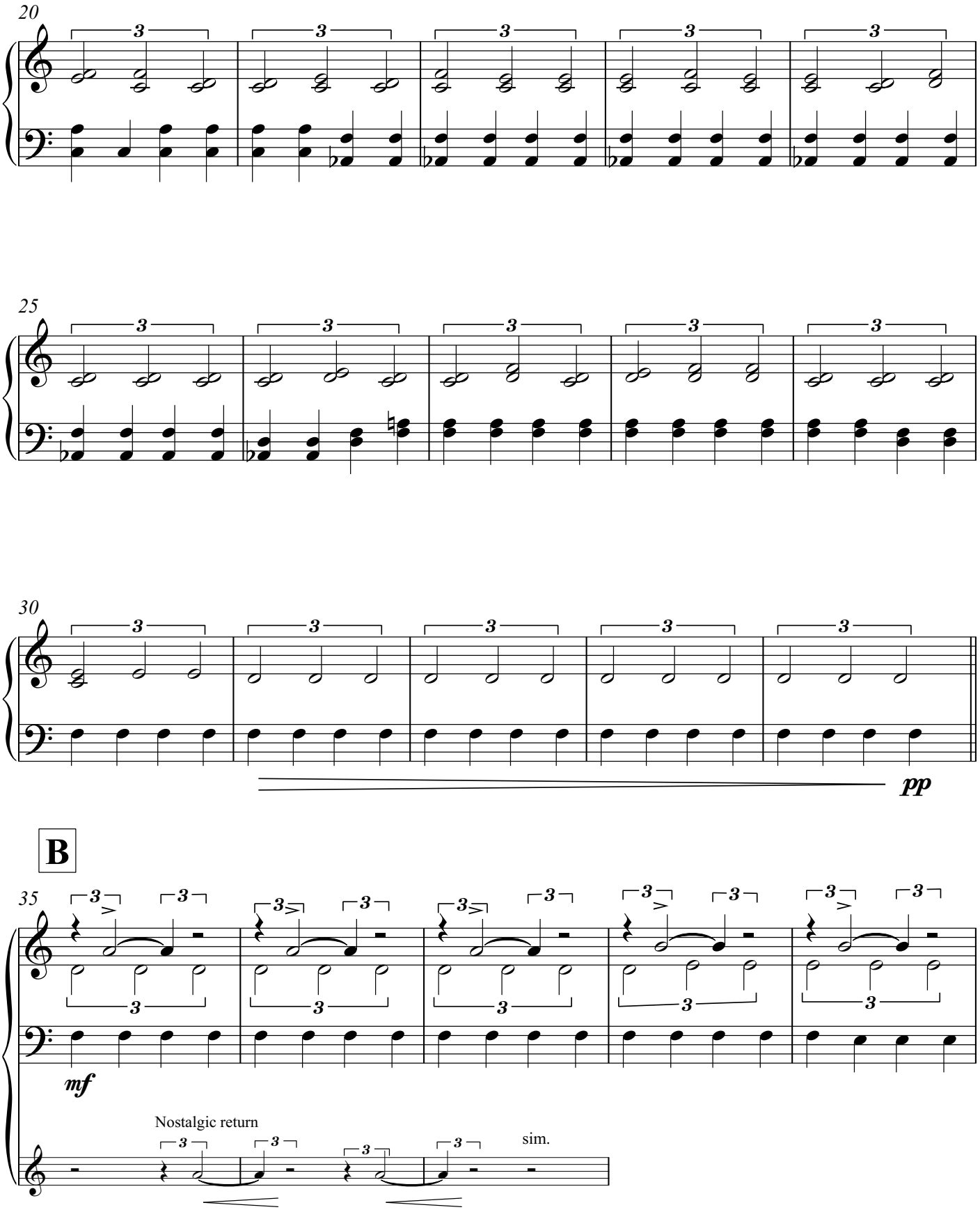
[1 min. 12 sec.]

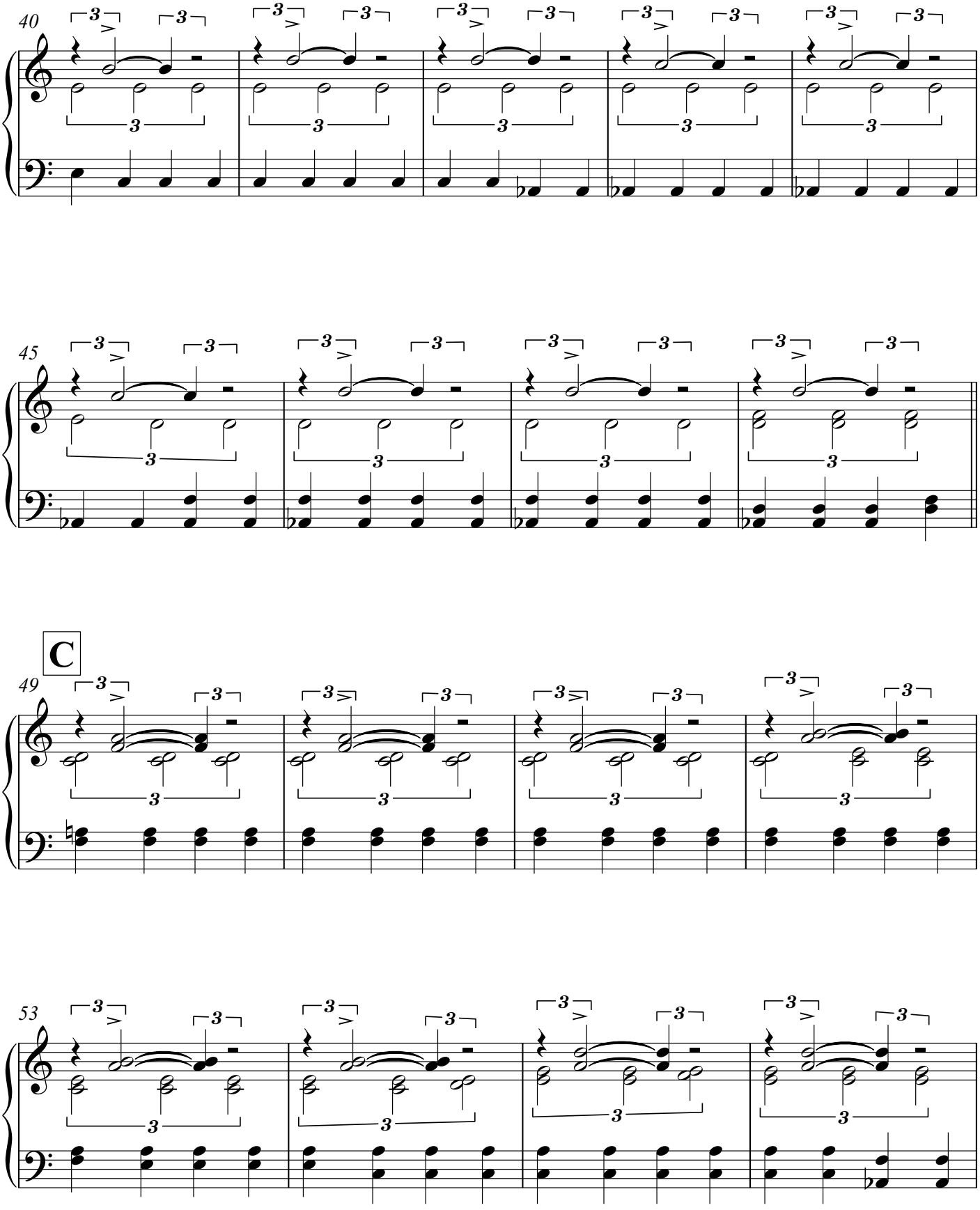
"Who do you think you are, Mars?"

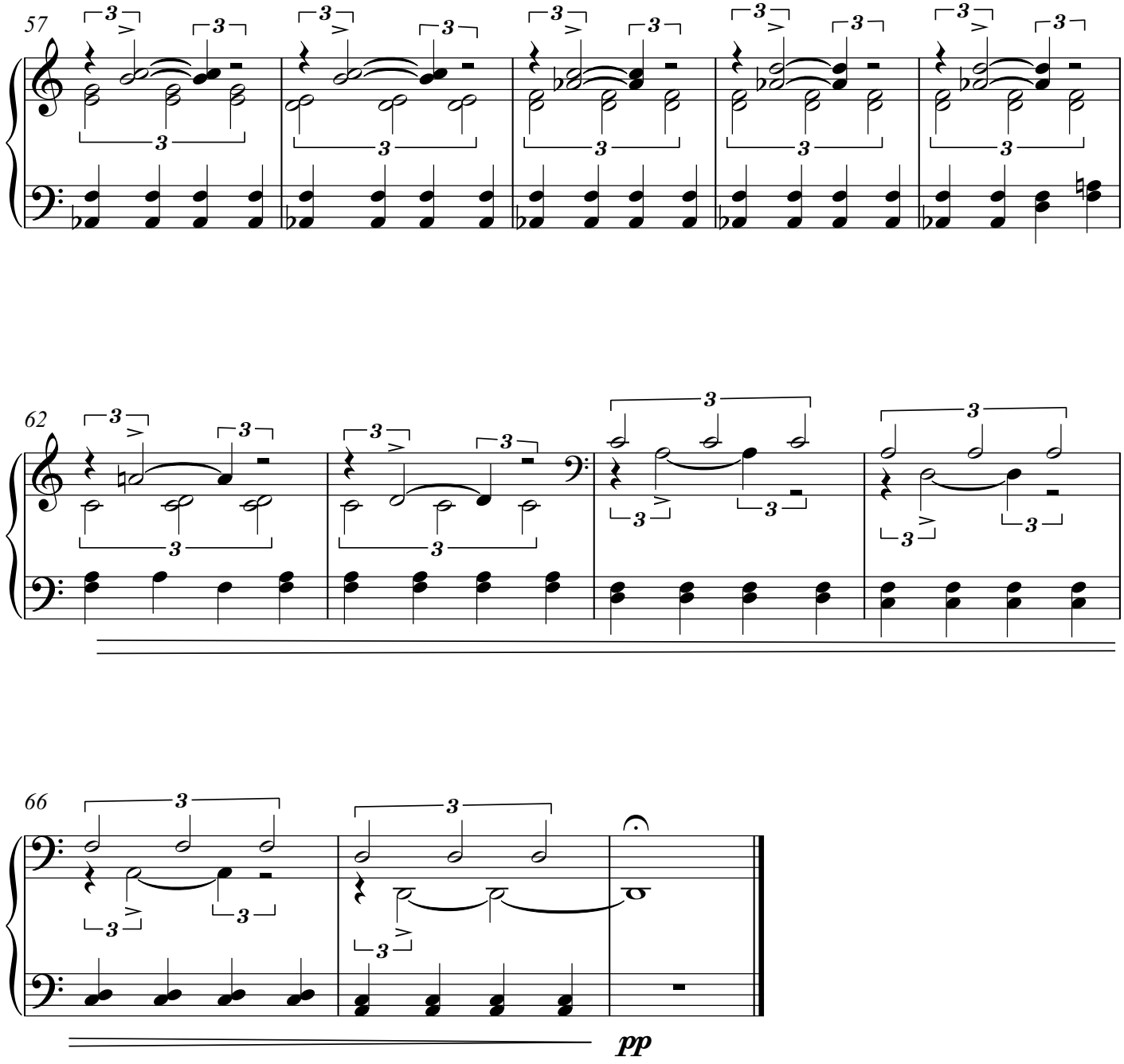
for Dan Trueman and Adam Sliwinski

Brooks Frederickson




20
25
30
pp
B
35
mf
Nostalgic return
sim.


40
45
C
49
53

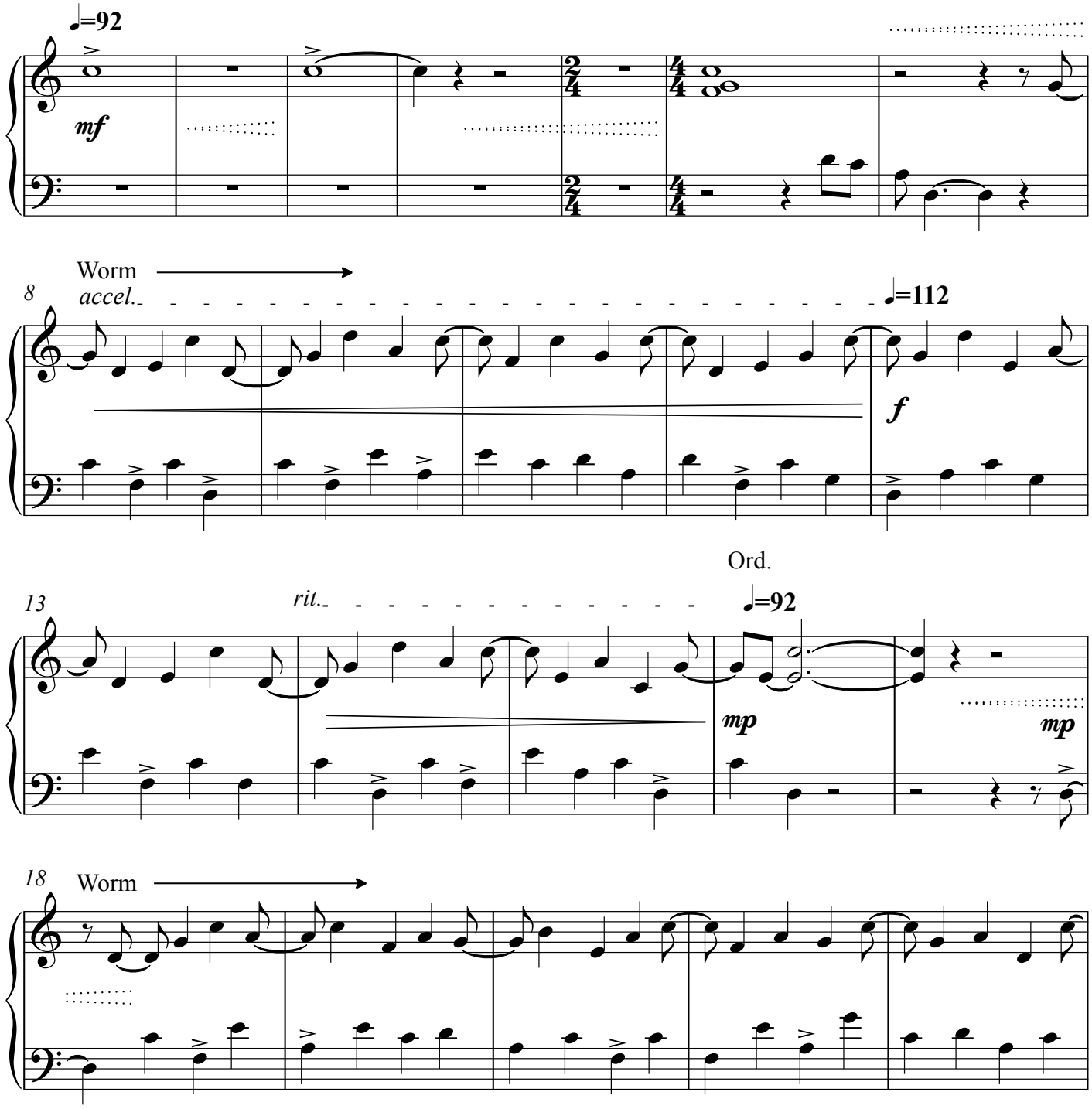


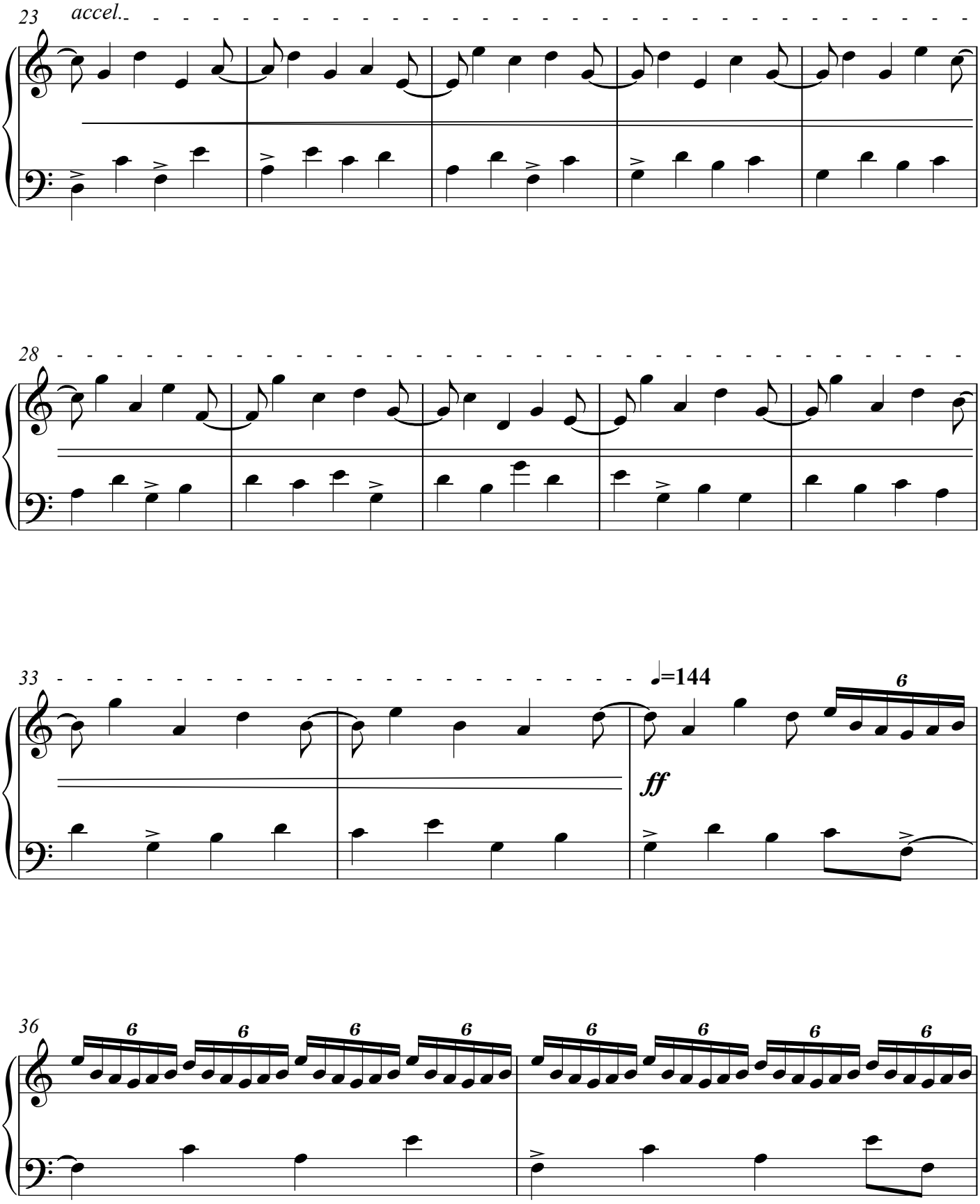
[1 min. 43 sec.]

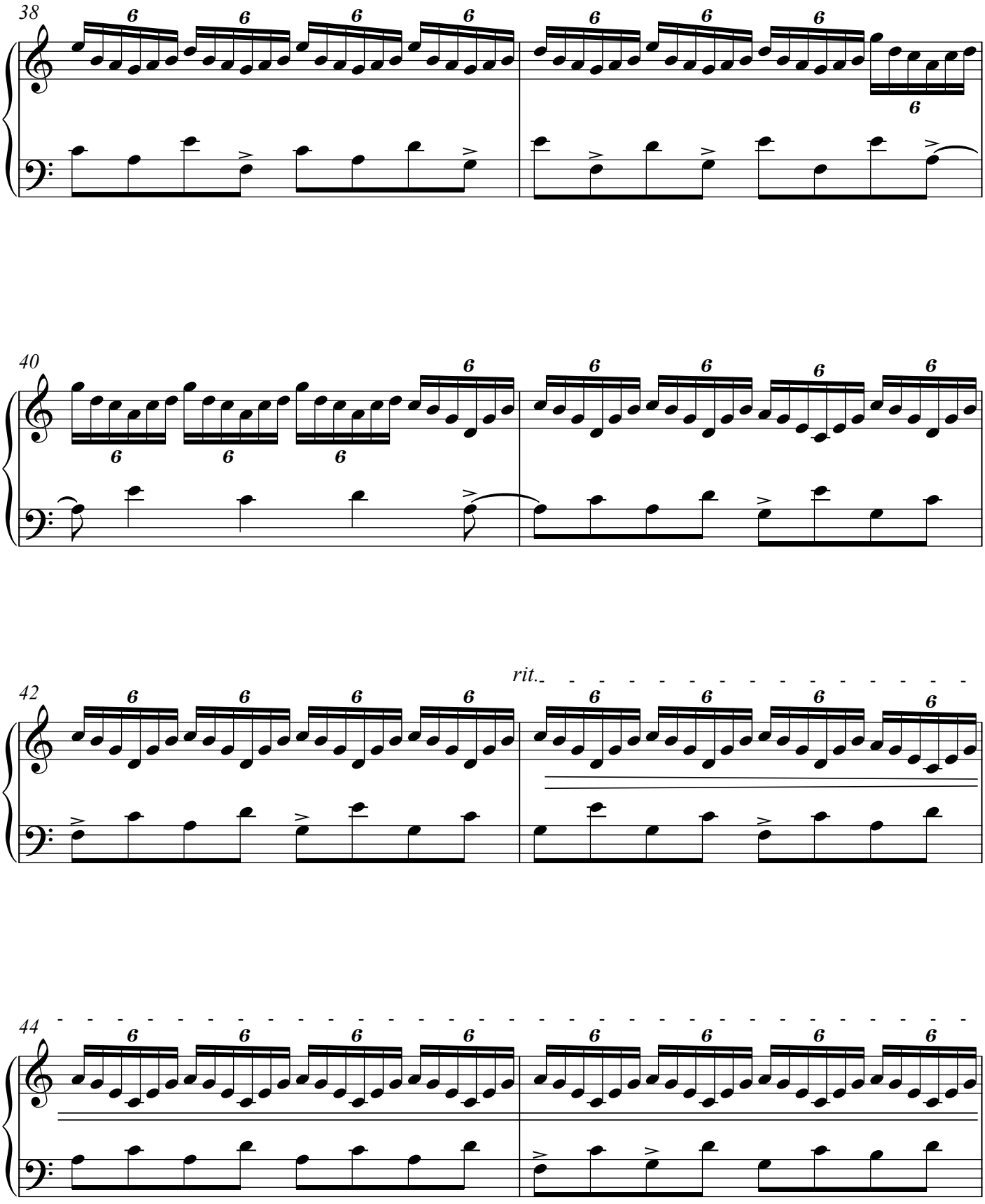
Worm

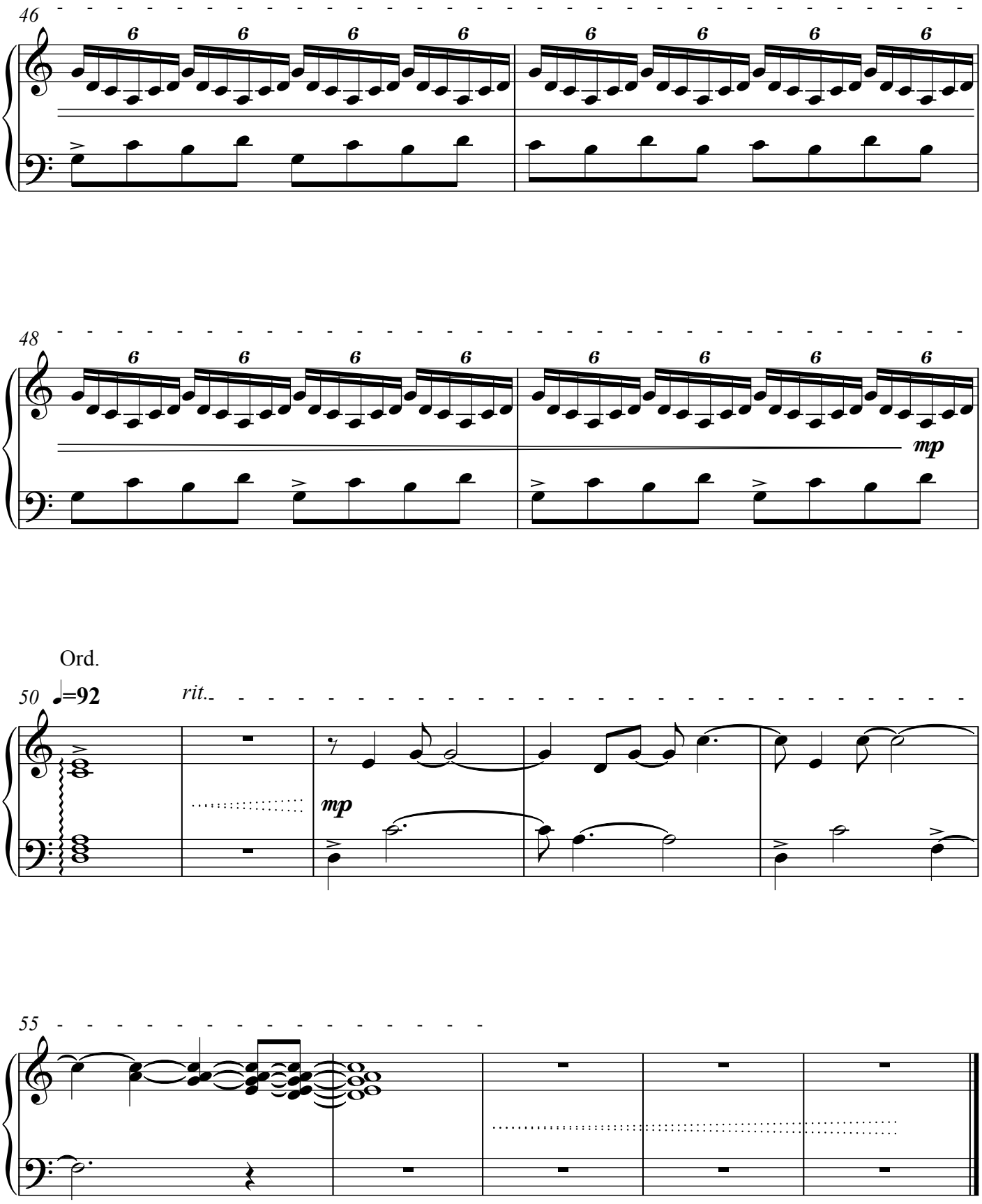
"Worm" means that notated rhythms only indicate when to attack each note and that you should hold each note as long as possible, until you need the finger in use to play another note. "Ord." turns this direction off.

Gideon Broshy




23
accel.
28
33
♩=144
ff
36

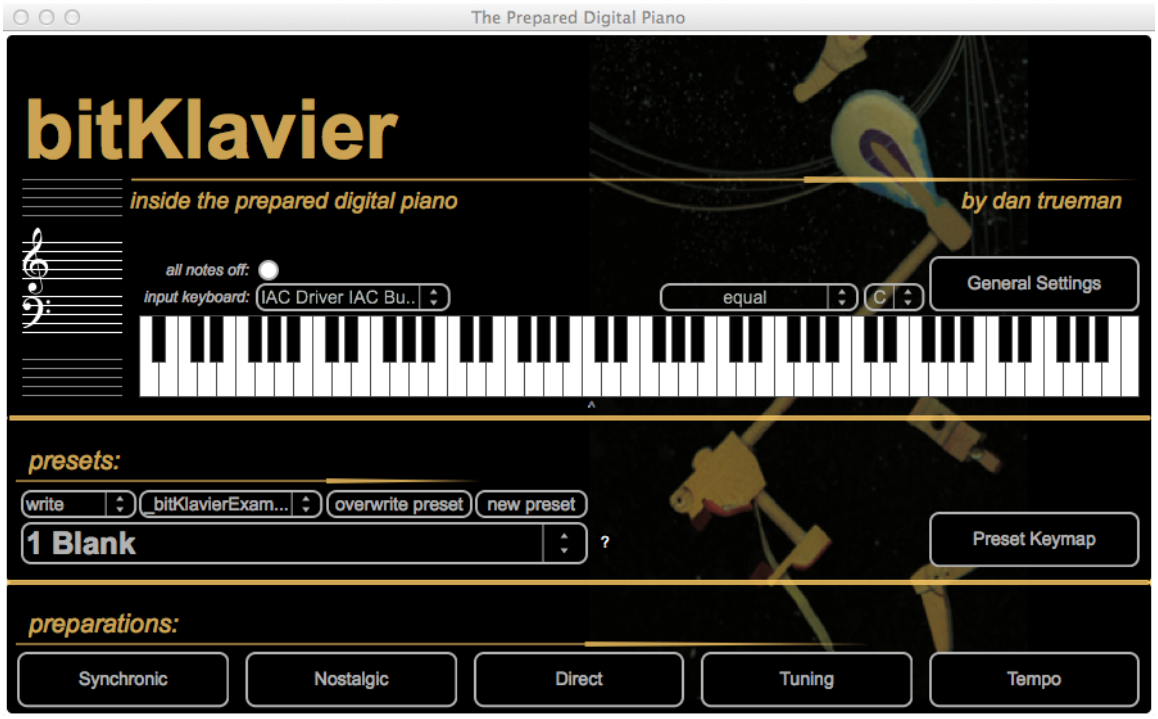

38
40
42
rit.
44



[2 min. 18 sec.]

Technical Notes

The Thing Itself:
…consists of a MIDI piano-style keyboard controller—a nice one ideally, that feels good under the hands—attached to a Mac computer (circa 2010 or later) running custom software (*bitKlavier*) with the digital "preparations." (as of this writing, and iPad version of the software is near completion, and a Windows version is under development.) Speaker setup and so on is left to the performer, but it should sound great! In performance, it should also look great, and care should be taken to conceal wires and minimize the "techie" appearance of things. I also imagine these being played solitary, through headphones.



The Main Screen:
…pictured above shows the main keyboard, and gives the player options to set the controller input and the tuning (described later) for the primary notes played. Below that is the Presets menu, where presets can be loaded, stored, and saved to disc. *Note that if you "re-store" or create a "new preset" those then need to be "saved" to disc if you want to be able to use them after quitting the application.*

For people only playing the instrument (as opposed to creating new preparations and presets), this window (and specifically the controller input menu and the preset menu) will be all you ever have to deal with!

For those interested in creating or simply looking at the various presets and preparations, the remaining buttons on this screen open additional screens for "preparing" the digital piano.

Note that the little **?** buttons open help screens with this information.

Synchronic Preparations:
This preparation began in the piece *120bpm*, from *neither Anvil nor Pulley*, that I composed for So Percussion. In that piece, the phase of a digital metronomic click is reset by striking a wood-block that the computer is listening to. Put another way: the metronome goes non-stop, clicking every 500ms, but every time the wood-block is struck, the count-down to the next click is reset to 500ms. I have found this almost inanely simple (though perhaps no more inane than putting a screw between a pair of piano strings) "machine" to be remarkably inspiring.

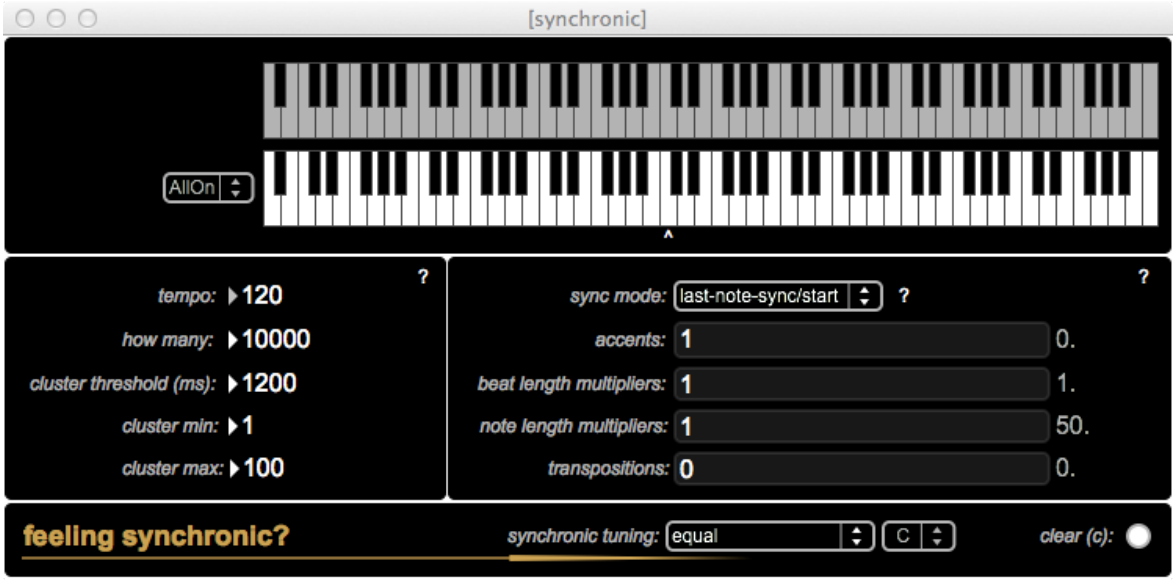


Figure 1: Synchronic Settings

The synchronic piano is similar except that instead of a click, the metronome sounds the most recent piano notes played. Playing the piano resets the phase, and any notes struck within a given "cluster threshold" are gathered and struck on every tick of the "metronome." The whole keyboard can function this way, or particular keys can be selected to be "synchronic."

The keyboard second from the top of Figure 1 is where the synchronic "keymap" can be setup, turning on/off the synchronic behavior for those keys (the top keyboard shows what notes are currently being held on the controller, for reference). Preparations can apply to the entire keyboard, or (as in this example) only to specific keys (highlighted in yellow here). Other things in Figure 1:

- ***how many***: how many metronome cycles to play before stopping
- ***cluster threshold (ms):*** how close notes need to be played together to be included in the metronome "cluster"
- ***cluster minimum/maximum***: minimum (or maximum) number of notes to be played within that threshold to create a metronome (so, in this example, playing a single note will effectively silence the metronome — very handy)
- ***synchronic tuning/fundamental***: more on tunings later, but this sets the tuning system for the metronome notes
- ***sync mode***: determines how the syncing is triggered:
    - *last-note-sync/start*: the *last* note in the cluster within the threshold sync the metronome
    - *first-note-sync*: the *first* note in the cluster within the threshold sync the metronome
    - *note-off-sync*: each note off syncs the metronome
    - *note-off-start*: like *note-off-sync*, except the metronome starts just as the note is released, as opposed to one cycle later
    - *first-note-start*: like *first-note-sync,* except the metronome starts when the note is struck, rather than one cycle later
- ***tempo***: sets the tempo, in bpm, for the metronome
- ***accents***: defines a sequence of accents for the metronome to cycle through
- ***beat length multipliers***: multiplies the basic time difference between metronome clicks (the *inter-onset-interval*, or IOI). In this example, the single value essentially speeds up the tempo of the metronome, while other examples (like preset "Etude7-2") go through a sequence of values, essentially warping the meter.

- ***note length multipliers***: multiplies the base length of each metronome note, so some can be longer than others.

Nostalgic Preparations:
This preparation also began in *120bpm* from *neither Anvil nor Pulley*. In *120bpm*, metal pipes are struck and sampled live by the computer.

Figure 2: Example Nostalgic Preparation

When the computer hears that a pipe has been struck, it notes how much time needs to pass until the next metronome click, then it waits (while sampling the pipe) until *half* that time has passed, and then begins playing the newly sampled pipe backwards so that it reaches its attack in sync with the next click. The effect of this is a reverse delay that is shaped and constrained by the prevailing metronome pulse.

In Figure 2, the top channel shows the metronome pulses, while the bottom channel shows two different pipe strikes, placed at different time locations between pulses, and then the reverse of that strike, peaking at the subsequent metro pulse.

As with the synchronic settings, the nostalgia can be limited to particular pitches, as set with the keyboard second from the top of Figure 3 (in this example, all the keys are prepared). Other nostalgic parameters include:

- ***length multiplier***: stretches (or compresses) the nostalgia relative to the expected time (set by played note length, so this only works when *the sync mode* is set to "note length;" see below)

- ***beats to skip***: rather then reversing to the next click, skip some before peaking (only works when sync mode is set to "synchronic")
- ***nostalgic tuning***: tuning for the nostalgic notes; again, more on this later
- ***sync mode***: determines how to time the nostalgic notes
    - *synchronic*: as described above, time the nostalgic notes so they peak with the metronome pulses
    - *note-length*: the length of the nostalgic notes are set by how long the original notes are actually played; so this is completely decoupled from the synchronic metronome pulse
- ***wave distance (ms):*** when this is non-zero, the nostalgic note peaks a given time short of its attack, and then reverses direction, now moving forward for a certain amount of time (set by undertow). This has the effect of smoothing out the peaks, giving a swell rather than an attack
- ***undertow (ms):*** as just described, this determines how long to continue forward in the live sample after peaking

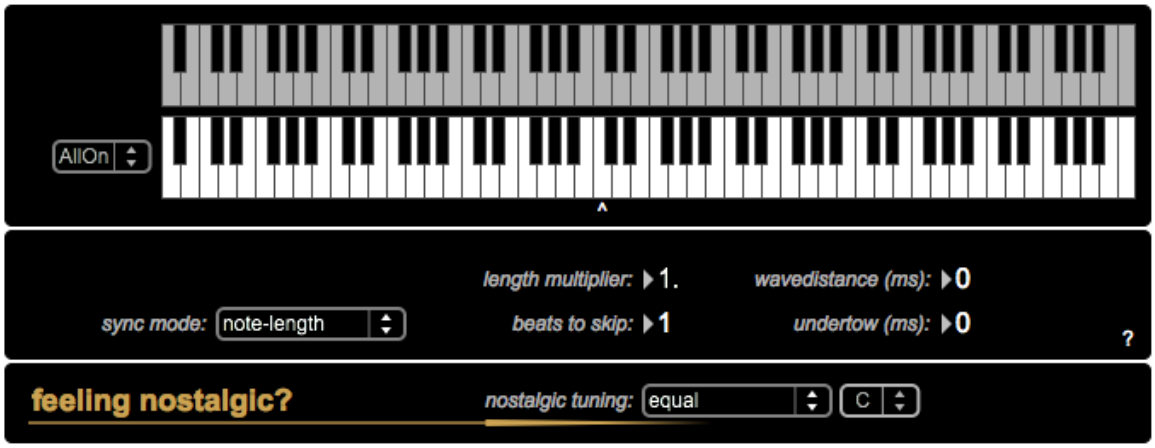


Figure 3: Nostalgic Settings

Direct Preparations:
This preparation is (for the moment) dead simple; highlighted notes will not sound when they are played, though their preparations *will* activate; this is surprisingly useful. This preparation is in part inspired by Ligeti's *Touches Bloquées* etude.

Tuning:
In addition to equal temperament, this piano uses two tunings that I began working with in *Justice Partial*, a piece I composed for the Kalamazoo Laptop Orchestra and two Disklaviers. The *just* tuning is a conventional just-intonation temperament, while the *partial* tuning is based in part on intervals drawn from the overtone series:

	Partial Tuning			**Just Tuning**		
Pitch	*Frequency*	*Ratio*	*Cents from ET*	*Frequency*	*Ratio*	*Cents from ET*
G#	**806.67**	**11/6**	**-51**	**825**	**15/8**	**-12**
G	770	7/4	-31	770	7/4	-31
F#	733.33	5/3	-16	733.33	5/3	-16
F	**715**	**13/8**	**+41**	**704**	**8/5**	**+14**
E	660	3/2	+02	660	3/2	+02
D#	**605**	**11/8**	**-49**	**616**	**7/5**	**-17**
D	586.33	4/3	-03	586.33	4/3	-03
C#	550	5/4	-14	550	5/4	-14
C	**513.33**	**7/6**	**-33**	**528**	**6/5**	**+16**
B	495	9/8	+04	495	9/8	+04
Bb	469.33	16/15	+12	469.33	16/15	+12
A	440	1/1	0	440	1/1	0

Figure 4: The Partial and Just Tunings, A Fundamental

These tunings are variously inspired. The most direct inspiration is from a recording of the Norwegian bridal march *Bruremarsj frå Engerdal* by Sven Nyus, the first Norwegian fiddle tune I ever learned, In particular, the 6th (F/A) is usually somewhere between and major and minor-6th, sounding similarly to the 13th partial; an awesome sound. He sometimes at the ends of phrases lets this rise up slightly to a just-tuned major-6th—glorious difference tones!—and occasionally lets it sink to a just-tuned minor-6th. This was the starting point for building these two scales, and why they are so named. In Hardanger fiddle music, I often hear the major-7th tuned quite flat (11/6 sounds like the closest ratio to what I often hear, and I've chosen to use ratios of some sort for all these intervals), and similarly, the raised 4th—giving the

Hardanger music its characteristic "Lydian" sound—is not *so* raised (it also sounds a bit flat, to equal-tempered ears). While I am not typically drawn to number games in music, there is a certain symmetry to the way this D# is mirrored by the "partial" F around the perfect 5th E (11/8 : 12/8 : 13/8), and for that reason, I chose to tune the minor-3rd C similarly symmetrical to the previously described "flat" major-7th (7/6 : 9/6 : 11/6). I love the way these two scales sound relative to one another; the qualities of the 6ths and minor-3rds in particular are vivid, and it's not hard to start hearing voice leading patterns between them.

Partial tuning is probably not the best name for this tuning, as it is not consistently based on overtones ("bruremarsj tuning" or "fiddle tuning" might be better, I suppose), but it is the name I've used for some time now and I feel stuck with it.

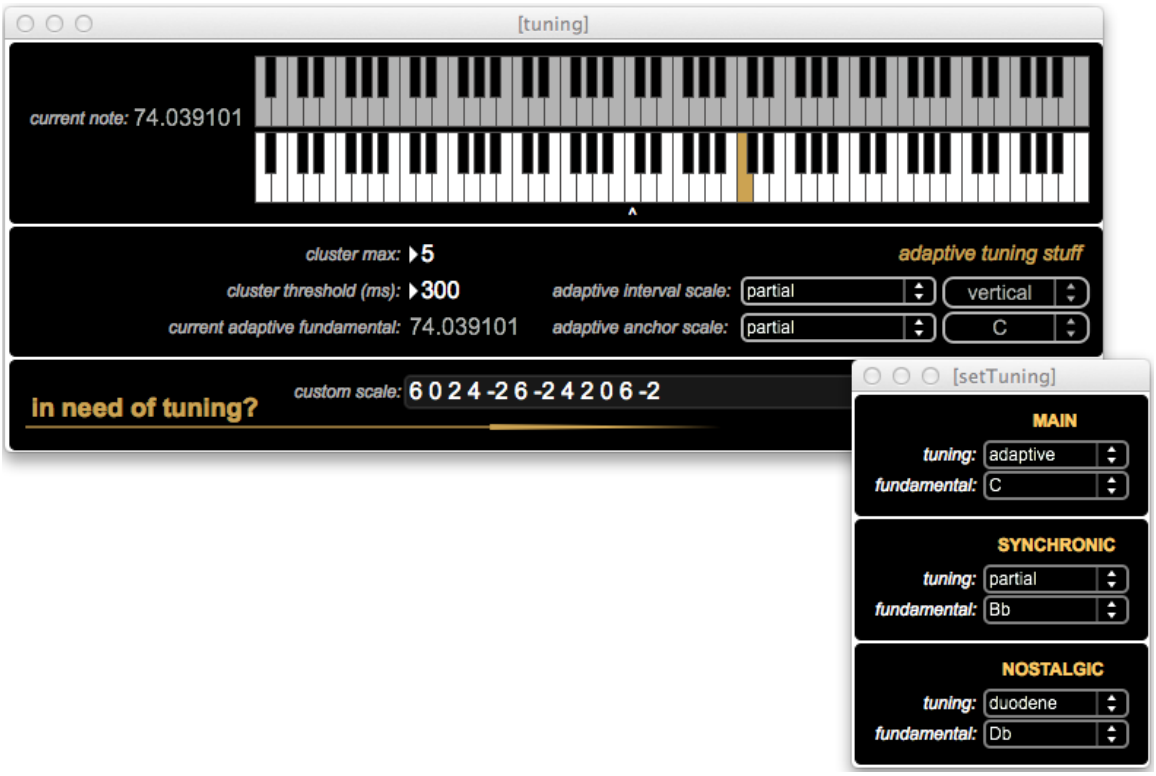


Figure 5: Tuning Settings

These tunings can be set independently for the played piano notes, the synchronic notes, and the nostalgic notes. They can also change on the fly, depending on the notes played, with the "tuning keymap" (see Figure 5).

When notes in the keymap keyboard are selected, a dialog box opens to set what tuning and fundamental to switch to when that note is actually played.

In addition to the partial, just, and equal-tempered tuning, we have two *adaptive* tunings, tuning which change as you play, endeavoring to make every interval just-tuned with its predecessor. This will naturally cause some drift (something I find musically quite enticing), so the *adaptive_anchored* tuning will fix the note given by the fundamental to an equal-tempered frequency. You can, of course, invent your own anchorings and modifications of this through using the tuning keymap. There are also a handful of additional tunings, and a simple way to enter a *custom scale*.

Presets:
All of these settings can be saved as presets and then recalled using the main pulldown menu (see Figure 6). For each of the Etudes, an initial preset is specified in the score that the player should select before beginning.

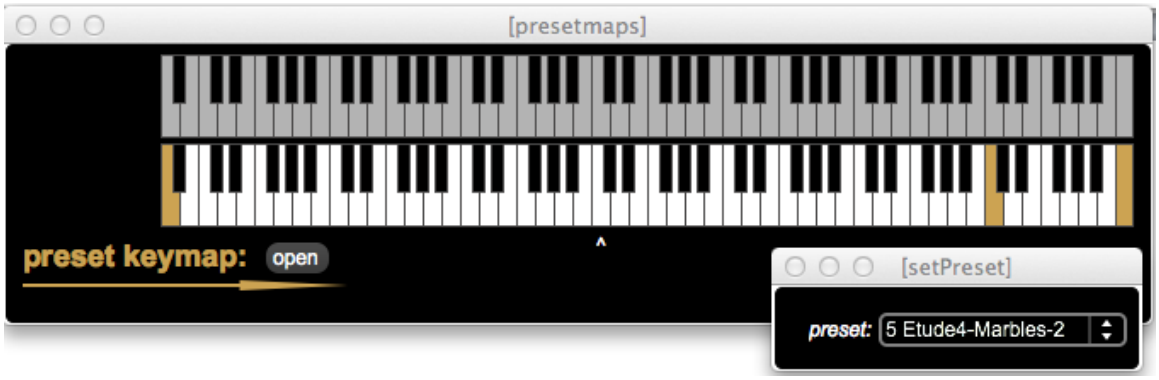


Figure 6: Presets

However, as with tuning, there is also a preset keymap, so specific keys can call up new presets. This is leveraged in many of the Etudes (#4 and #7, for instance). The player doesn't have to worry about these changes as they are composed into the piece; however, when practicing in the middle of one of the Etudes, it will be important to choose the correct preset for that moment (preset changes are indicated in the score, so it should be possible to find the needed preset).

General Settings:
Here the piano's main frequency (for A) can be set, and a global tempo multiplier can be set you want all the presets to scale in tempo (this can be useful for practice, or if you prefer to perform some of the etudes faster or slower than the presets are composed for, without having to revise all the presets).

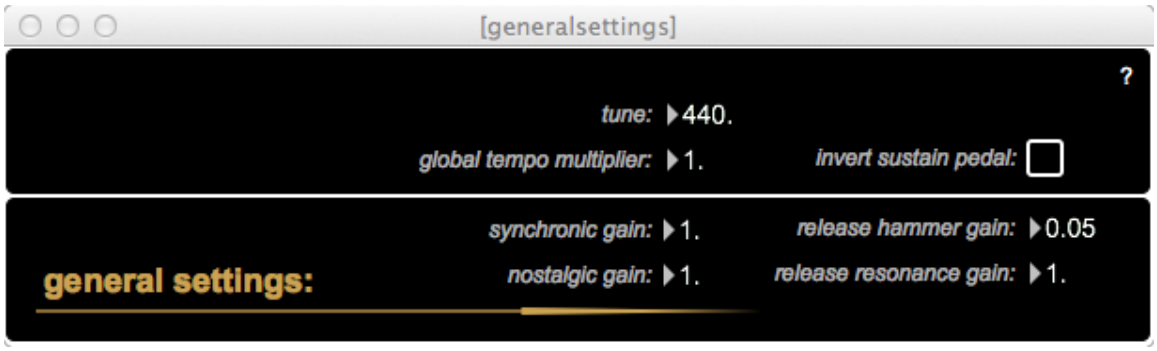


Figure 7: General Settings

The relative gains of the synchronic and nostalgic preparations can be adjusted here as well, if they seem too loud or soft for a particular situation (again, setting them here means you don't have to revise all the presets), as can the samples for the hammer releases and release resonances (if you don't know what these are, turn them up high and explore the low keys on the keyboard).

Finally, some MIDI controllers seem to invert the sustain pedal signal, resulting in all notes being sustained been the pedal is up; this can be fixed by toggling on the "invert sustain pedal" button.

The Console:
… is a window (pictured below) that opens on launch that displays status information about the instrument. You probably only care about this at the beginning, so you can watch to see when all of the samples are loaded and ready.