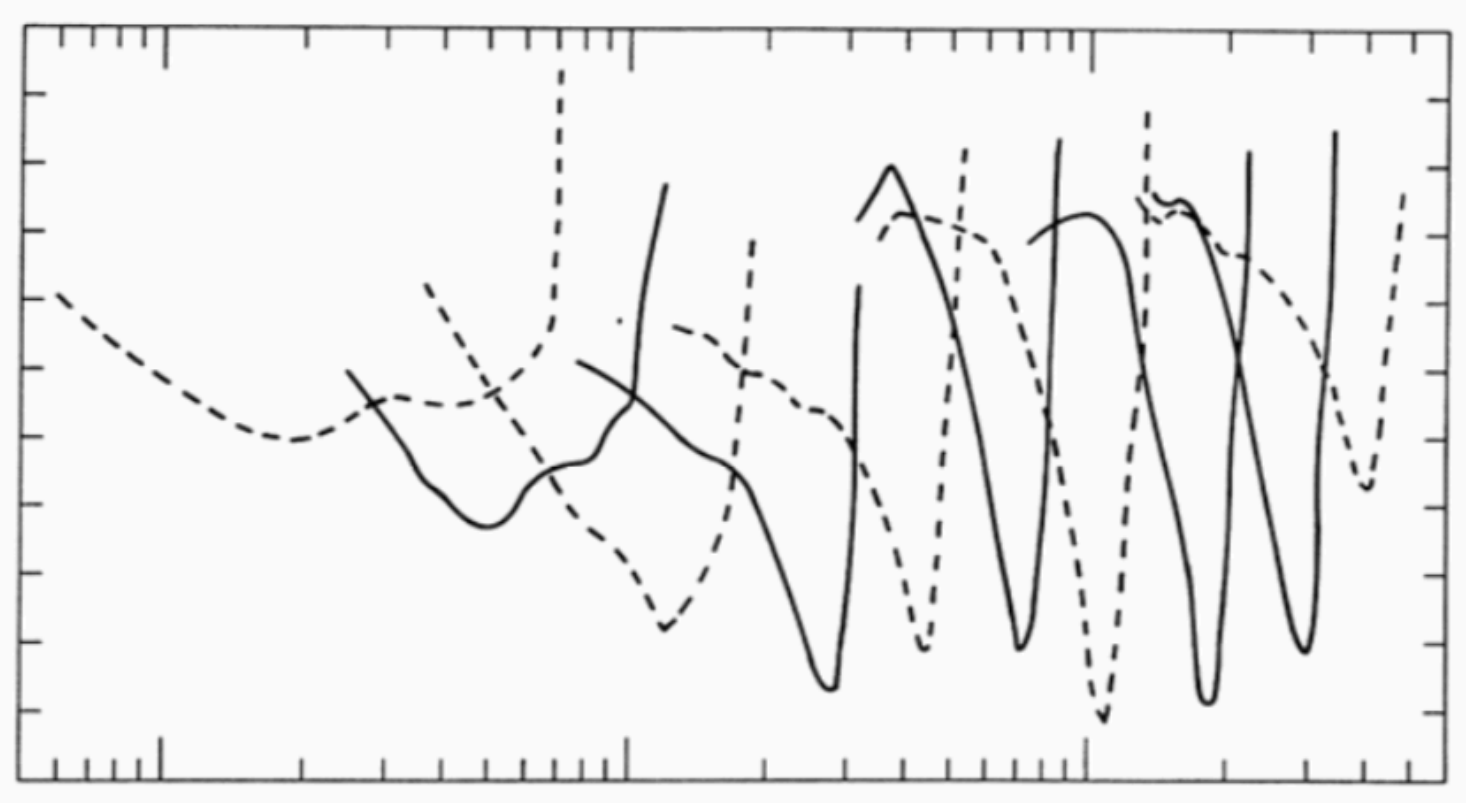
MASKING SONGS

for daxophones and strings



Daniel Fishkin

2020, revised 2022

INTRODUCTORY TEXT

It is worth considering the perceptual consequences of a loss of frequency selectivity. The first major consequence is a greater susceptibility to masking by interfering sounds. When we are trying to detect a signal in a noisy background, we use the auditory filter(s) giving the best signal-to-noise ratio. In a normal ear, where the auditory filters are relatively narrow, all of the background noise except a narrow band around the signal frequency is attenuated at the filter output. In an impaired ear, where the filters are broader, much more of the noise gets through the filter, and therefore, the detectability of the signal is reduced. Thus, background noises severely disrupt the detection and discrimination of sounds, including speech.

A second difficulty arises in the perceptual analysis of complex sounds such as speech or music. ...The perception of timbre depends on the ear's frequency selectivity. When frequency selectivity is impaired, the ability to detect differences in the spectral composition of sounds, and hence in timbre, is reduced. Thus, it may be more difficult for the impaired listener to tell the difference between different vowel sounds or to distinguish different musical instruments. Note that the provision of a hearing aid that simply amplifies sound will not overcome any of these difficulties. Such an aid may help to make sounds audible, but it does not correct impaired frequency selectivity.

An Introduction to the Psychology of Hearing, Brian Moore, 1995

Contrary to the masking of external sounds, it is possible to abolish the perception of tinnitus sounds by pure tones of a similar intensity regardless of their frequency (Feldmann, 1971). This proves that "masking" of tinnitus does not involve a mechanical interaction of basilar membrane movements, does not depend on the critical band principle and, therefore, has to occur at a higher level within the auditory pathways. Consequently, the elimination of the perception of tinnitus by another sound should be labeled suppression rather than "masking," as is commonly used. Unfortunately, Feldmann's fundamental discovery has been widely disregarded, resulting in focusing attention on masking rather than suppression and in producing tinnitus instruments tuned to the dominant perceived pitch of tinnitus.

Tinnitus Retraining Therapy, Pawel Jastreboff, 2004

MASKING SONGS

Masking Songs deals with the principle of auditory masking, in which the perception of a sound is affected by another sound. In lieu of a medical cure for tinnitus, auditory masking/suppression is one of the primary means for attenuating the perception of phantom sound. However, depending on what one is trying to mask, from the sounds of the acoustic world to the phantom sounds of tinnitus, the means of sound occlusion are formally distinct.

Obfuscate and discover the conscious music-making activity of other players. The primary goal is to achieve suppression and "unveiling" of sound you create. Tinnitus Scholarship terminologizes this relationship as "signal vs. masker": signal is the ever-insistent phantom perception of tinnitus, and the masker is that which can suppress it—acoustic sound.

Note: the word, "play" in the score —can refer to improvisation, or composed material decided in advance, or some combination.

Some of these pieces are notated, and others are open text scores. This songbook could be thought of as a "realbook" for Tinnitus Music. It is composed for daxophone and strings, but could easily be adapted for open instrumentation. Assemble a setlist from the following songs, uniquely ordered for each performance, based on the particular setting.

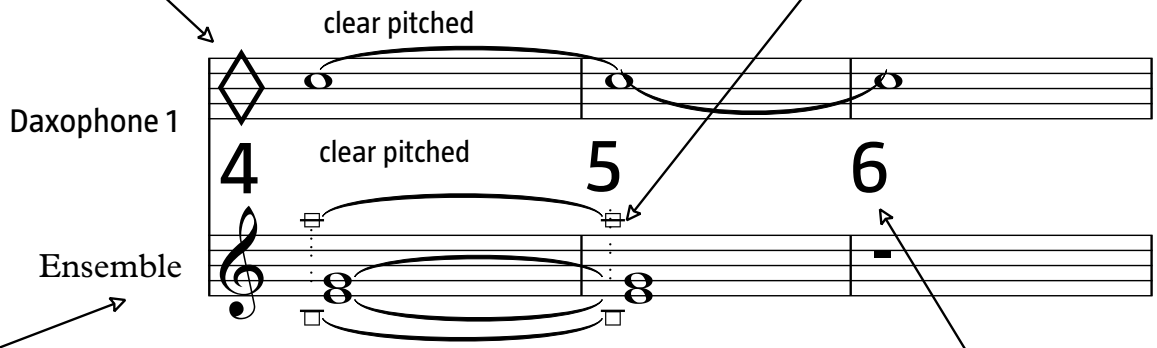
"Off Center Frequency Listening" utilizes a pitch set derived from an audiology research article[1] concerning the difficulty of frequency masking of tinnitus, which recorded the tinnitus bands, both as wide clusters and precise frequencies, from 32 patients. The piece also includes a pitch set of my own tinnitus, which despite changing in volume and pitch daily, was nevertheless was notated one day in Fall, 2022.

[1] (Fournier P, Wrzosek M, Paolino M, Paolino F, Quemar A, Noreña AJ. Comparing Tinnitus Tuning Curves and Psychoacoustic Tuning Curves. Trends in Hearing. 2019;23. doi:10.1177/2331216519878539)

notation legend

diamond clef (cf. Anthony Braxton) means relative "center frequency" placement. for daxophone, it means start anywhere with approximate contour of the melodic line. pick a new pitch center for different systems.

square noteheads represent a pitch range, in some cases wide and in some cases quite small, in which the player may choose to play inside. if square noteheads are present with a standard clef, observe the pitch-specifity as indicated.



each system has at least one soloist—the rest of the instruments play an ever-shuffling "ensemble" line and make decisions on how to space out the harmony. ensemble dynamics should always be slightly louder than solo.

large numbers refer to beats per measure. tempo is to be felt, use 60-80 bpm as a reference.

This piece is written for fiddle, contrabass, and three daxophones, though informed substition of instrumentation may be performed — adapt techniques to new instruments accordingly.

techniques utilized (both daxophone and strings):

- clear pitched
arco playing (no vibrato)

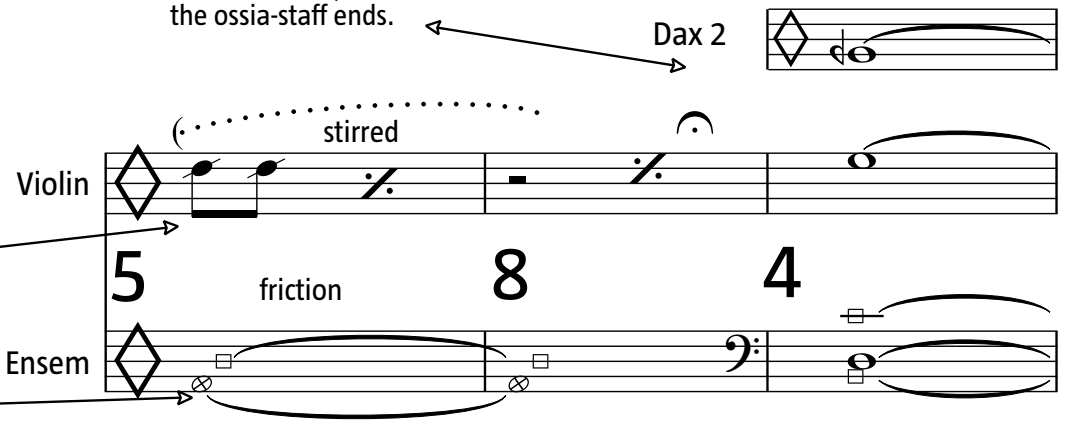
- pitched noise
"whispering", ie, not playing quietly, but drawing bow quickly with little pressure to produce noise overtones.

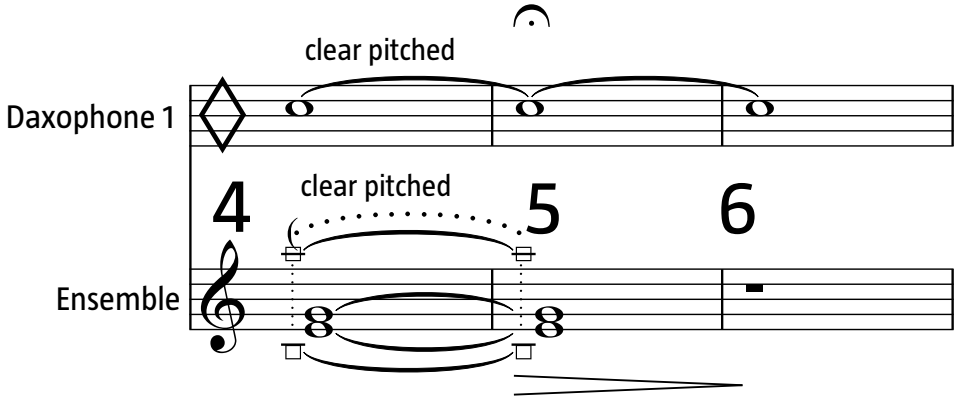
- col legno
for daxophone should use bowhair and stick together for the right sound

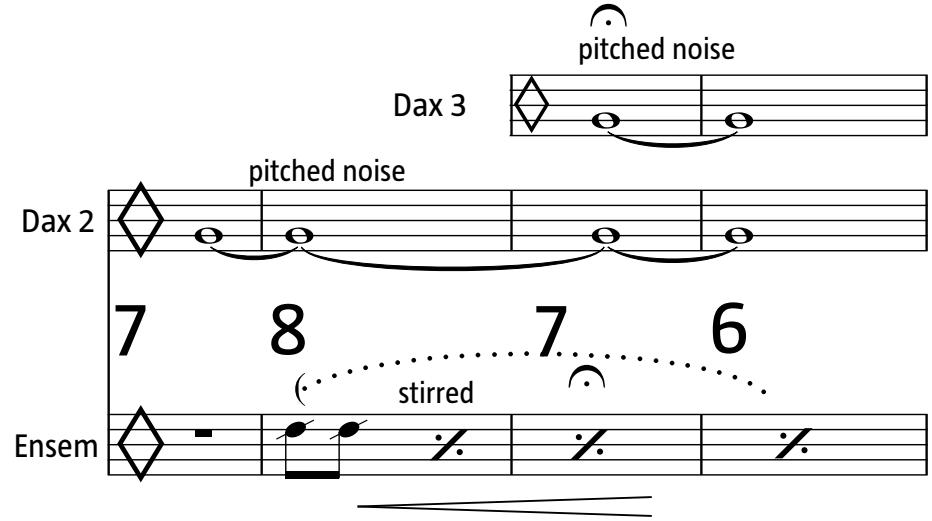
- rhythmic stirring
draw bow in circular motion moving up and down string

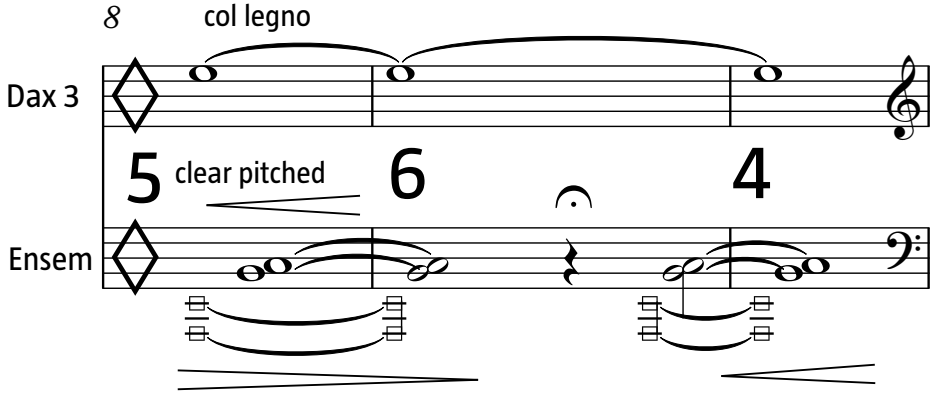
- friction
heavy pressure, lots of harmonics, not flatulent

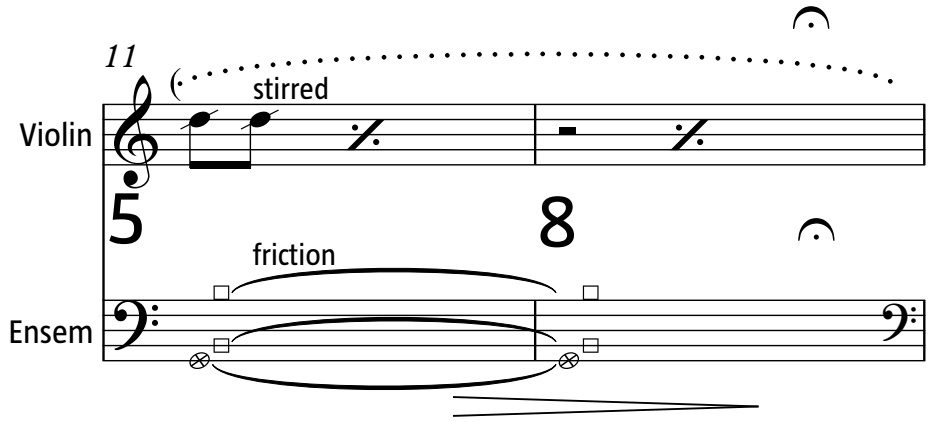
ossia-staff means that instrument leaves the ensemble to perform a dedicated solo, and returns when the ossia-staff ends.

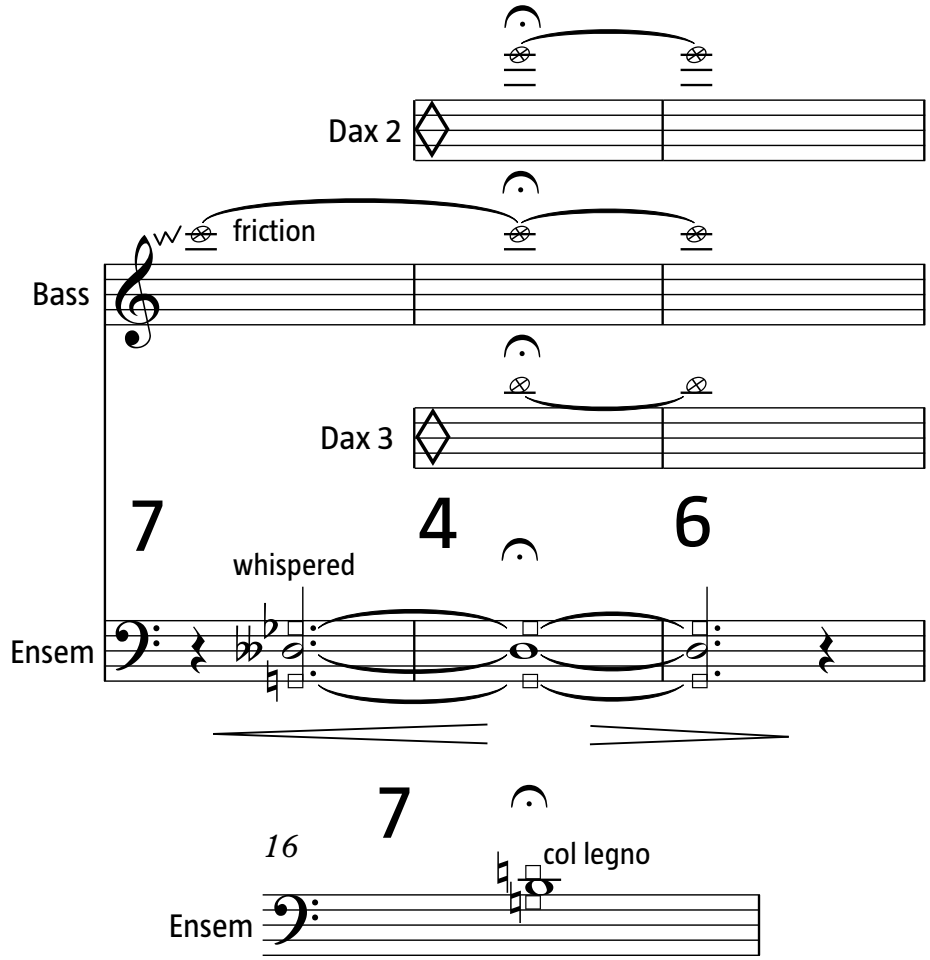


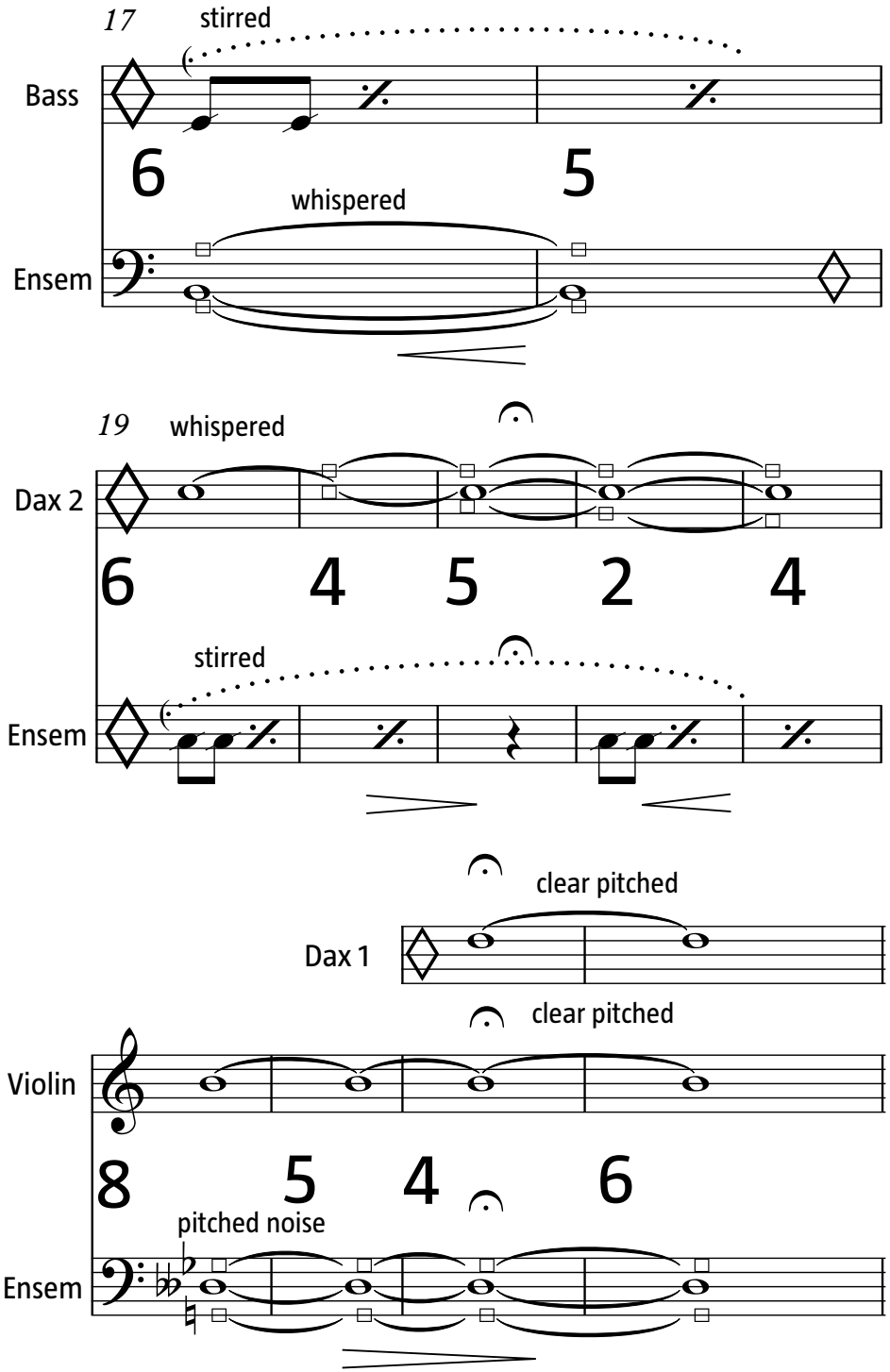

clear pitched
Daxophone 1
4
clear pitched
5
6
Ensemble

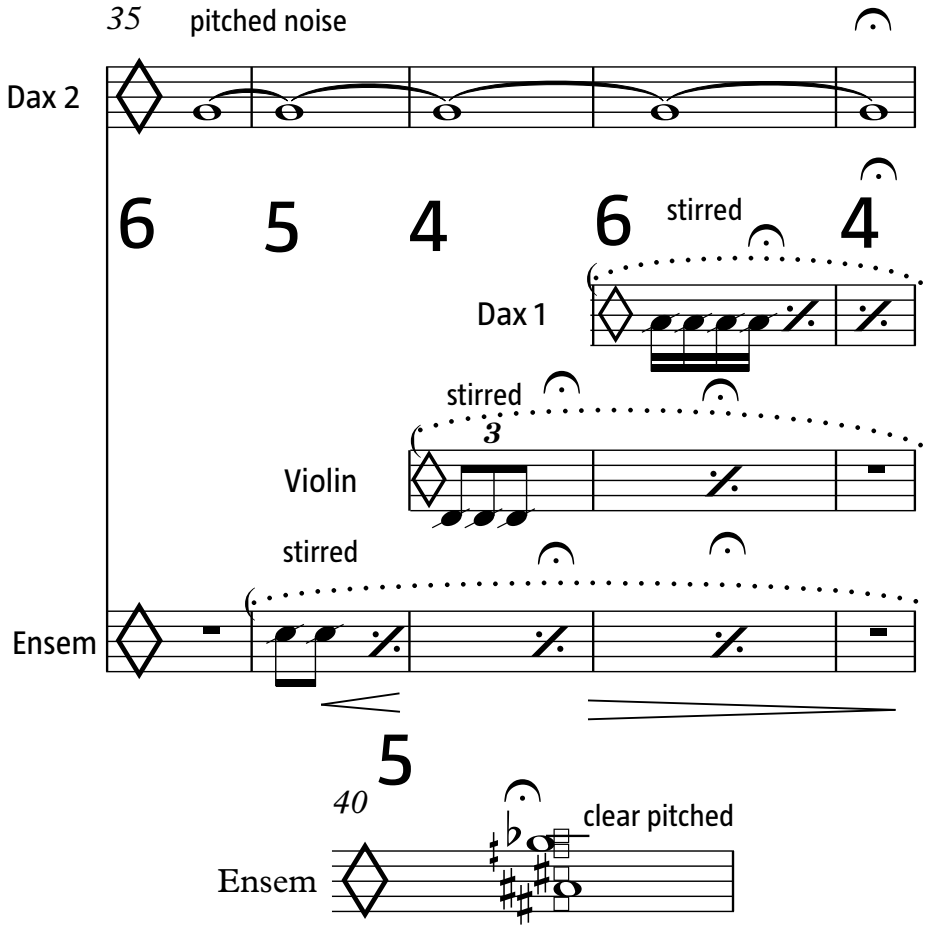

pitched noise
Dax 3
pitched noise
Dax 2
7
8
7
6
stirred
Ensem

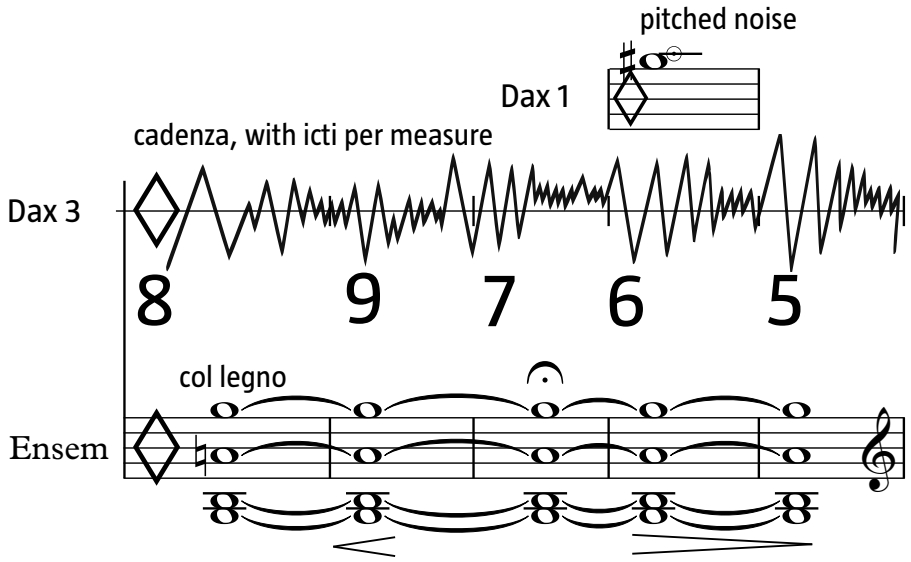

8
col legno
Dax 3
5
clear pitched
6
4
Ensem

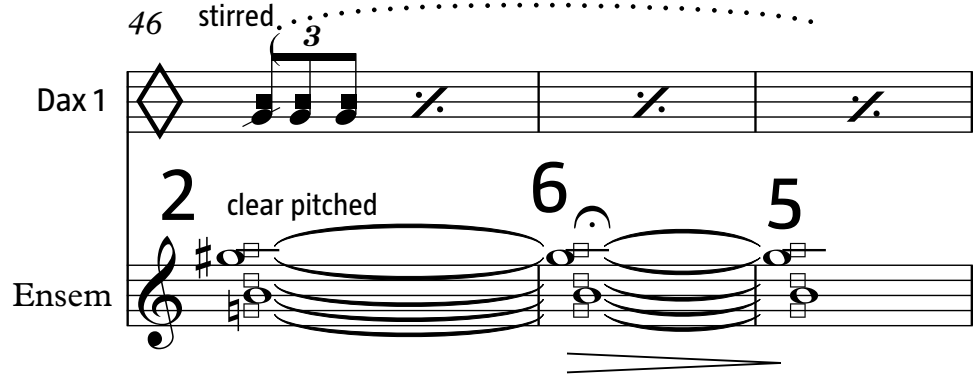

11
stirred
Violin
5
8
friction
Ensem

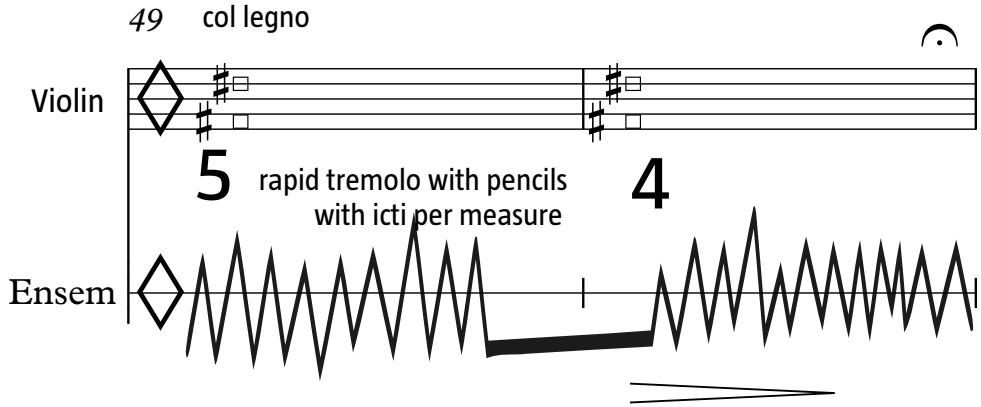

Dax 2
friction
Bass
Dax 3
7
4
6
whispered
Ensem
7
16
col legno
Ensem

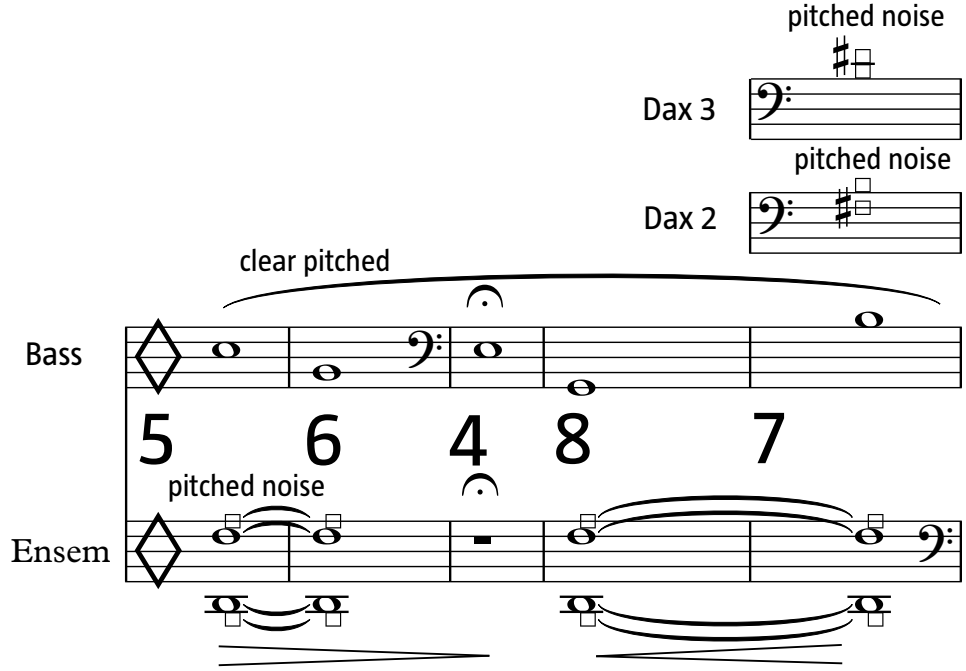

17
stirred
Bass
6
5
whispered
Ensem
19
whispered
Dax 2
6
4
5
2
4
stirred
Ensem
clear pitched
Dax 1
clear pitched
Violin
8
5
4
6
pitched noise
Ensem
28
8
col legno
Dax 3
29
friction but check note
Violin
4
7
stirred
Ensem
clear pitched
Violin
clear pitched
Dax 1
Bass
5
4
6
8
clear pitched
Ensem

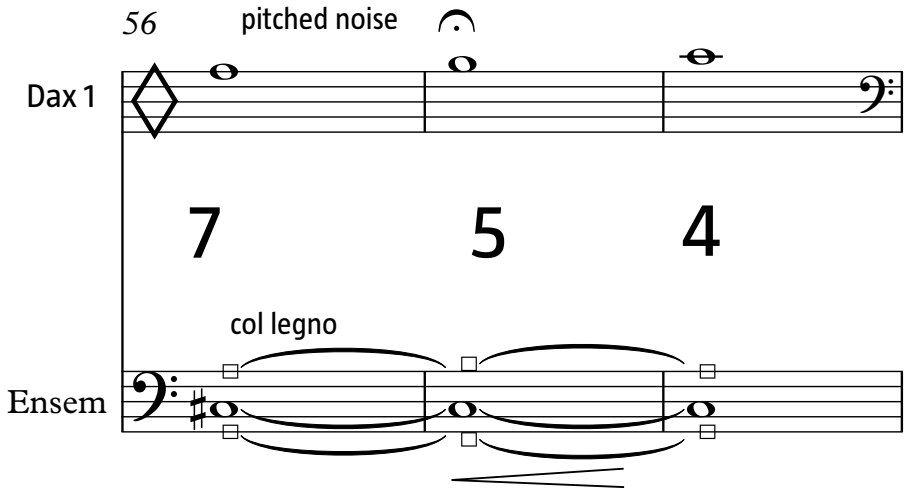

35
pitched noise
Dax 2
6 5 4 6 4
stirred
Dax 1
stirred
3
Violin
stirred
Ensem
5
40
clear pitched
Ensem

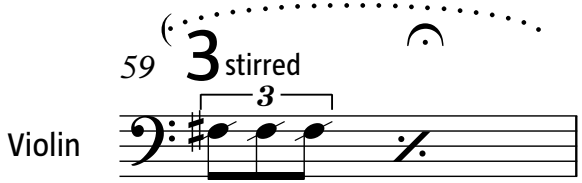

pitched noise
Dax 1
cadenza, with icti per measure
Dax 3
8 9 7 6 5
col legno
Ensem

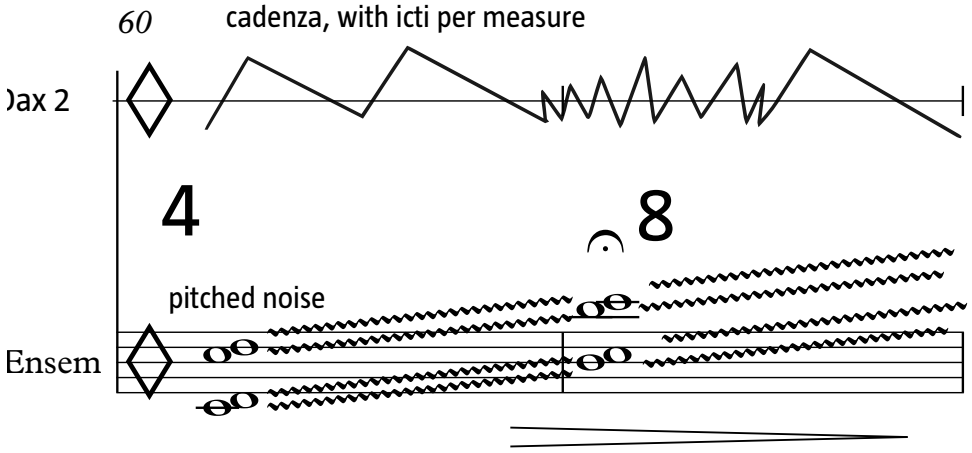

46
stirred
3
Dax 1
2
clear pitched
6 5
Ensem

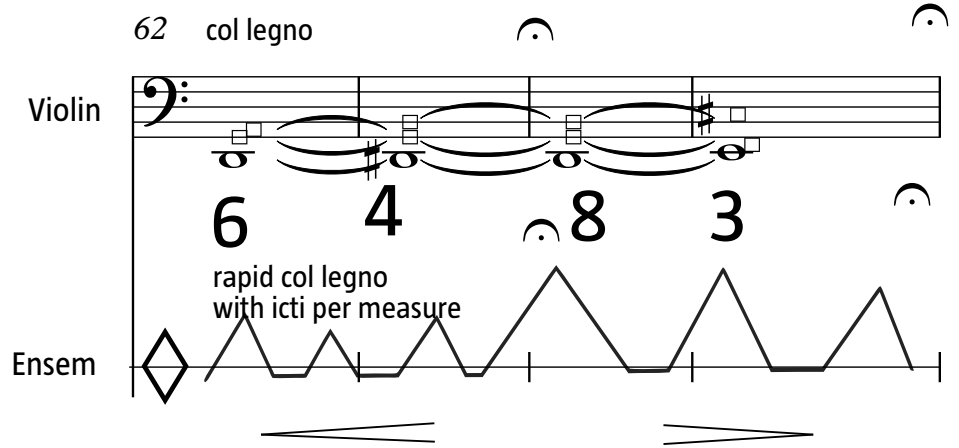

49
col legno
Violin
5
rapid tremolo with pencils
with icti per measure
4
Ensem

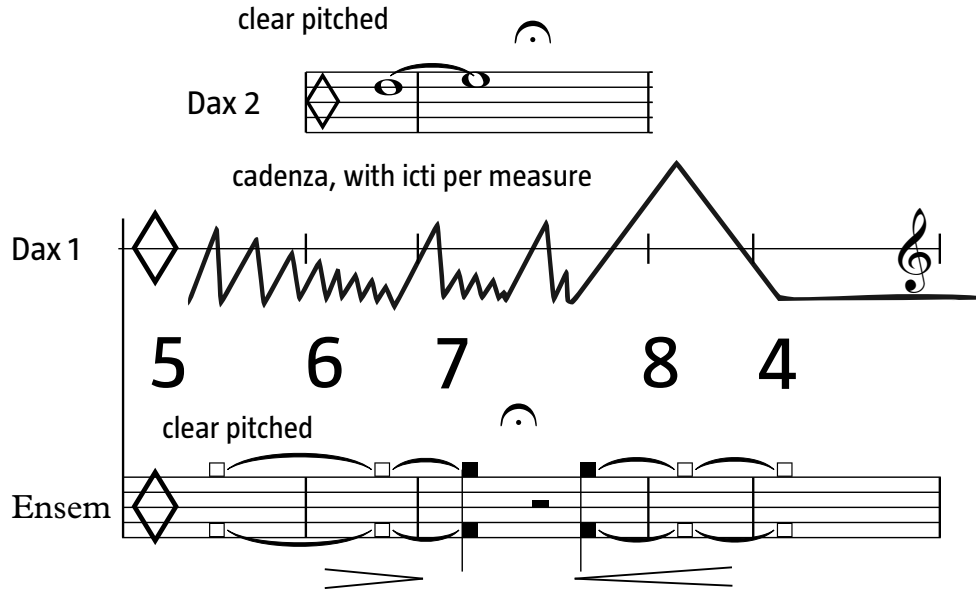

pitched noise
Dax 3
pitched noise
Dax 2
clear pitched
Bass
5 6 4 8 7
pitched noise
Ensem

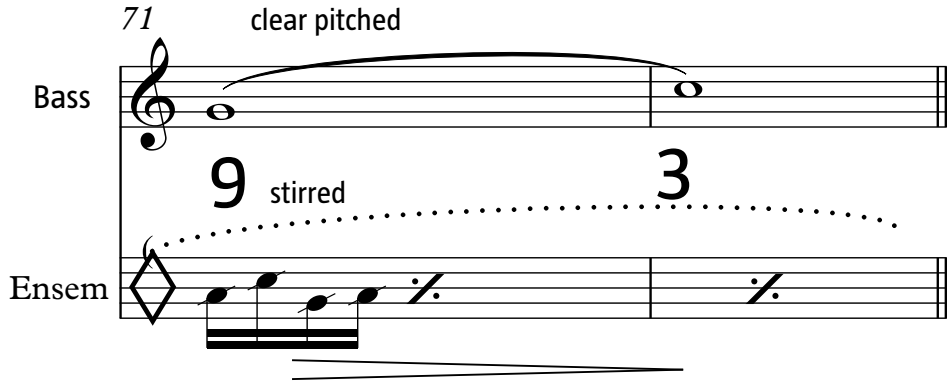

56
pitched noise
Dax 1
7
5
4
col legno
Ensem

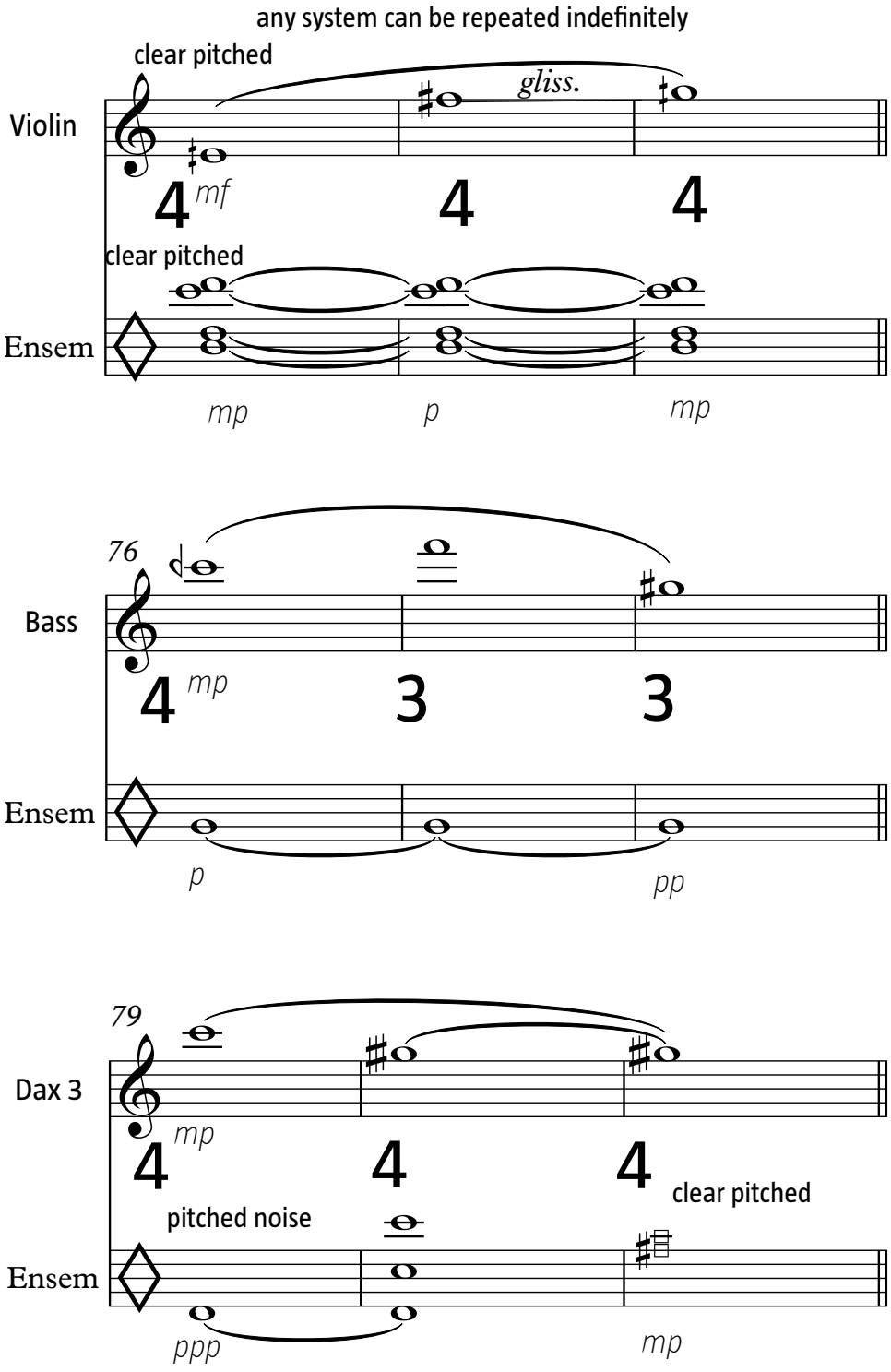

59
3
stirred
3
Violin

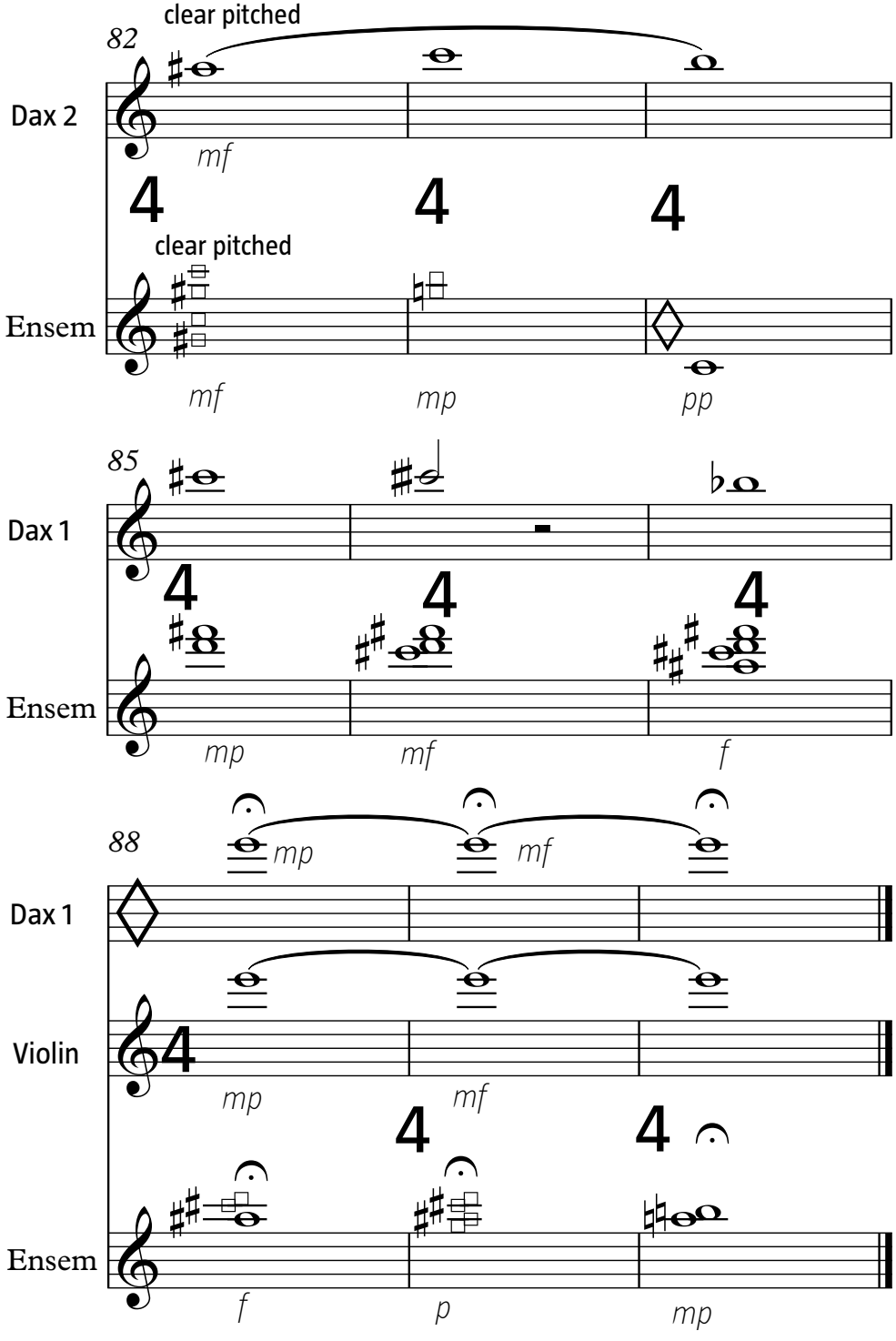

60
cadenza, with icti per measure
Dax 2
4
8
pitched noise
Ensem


62
col legno
Violin
6
4
8
3
rapid col legno
with icti per measure
Ensem


clear pitched
Dax 2
cadenza, with icti per measure
Dax 1
5
6
7
8
4
clear pitched
Ensem


71
clear pitched
Bass
9
stirred
3
Ensem


any system can be repeated indefinitely
clear pitched
Violin
gliss.
4
mf
4
4
clear pitched
Ensem
mp
p
mp
76
Bass
4
mp
3
3
Ensem
p
pp
79
Dax 3
mp
4
4
4
clear pitched
pitched noise
Ensem
ppp
mp


82
clear pitched
Dax 2
mf
4
4
4
clear pitched
Ensem
mf
mp
pp
85
Dax 1
4
4
4
Ensem
mp
mf
f
88
mp
mf
Dax 1
Violin
4
mp
mf
4
4
Ensem
f
p
mp

Suppression

dynamic range: flow between *mp* — *ppp*
ensemble grouping: tutti or ad-hoc grouping

alternate sustained sounds, weaving over and under the group sound and individuals in the ensemble—
no silences—instead of falling silent go to *pppp*
try to suppress another sustained tone / try to "get under" a sound which is being sustained

Note: as sounds enter, focus on the threshold of audibility, of another sound.
Note: suppression may take place purely in a perceptual realm, rather than merely playing louder than someone else.

Simultaneous Masking

as above, but careful attention to frequencies to mask other sounds within the critical bandwidth— the band of audio frequencies within which a second tone will interfere with the perception of the first tone.
The critical bandwidth may be wider for different frequencies and will vary radically as different instrument timbres are combined.

Note: as sounds enter, focus on the threshold of audibility, of another sound.

Excitation / Swamping

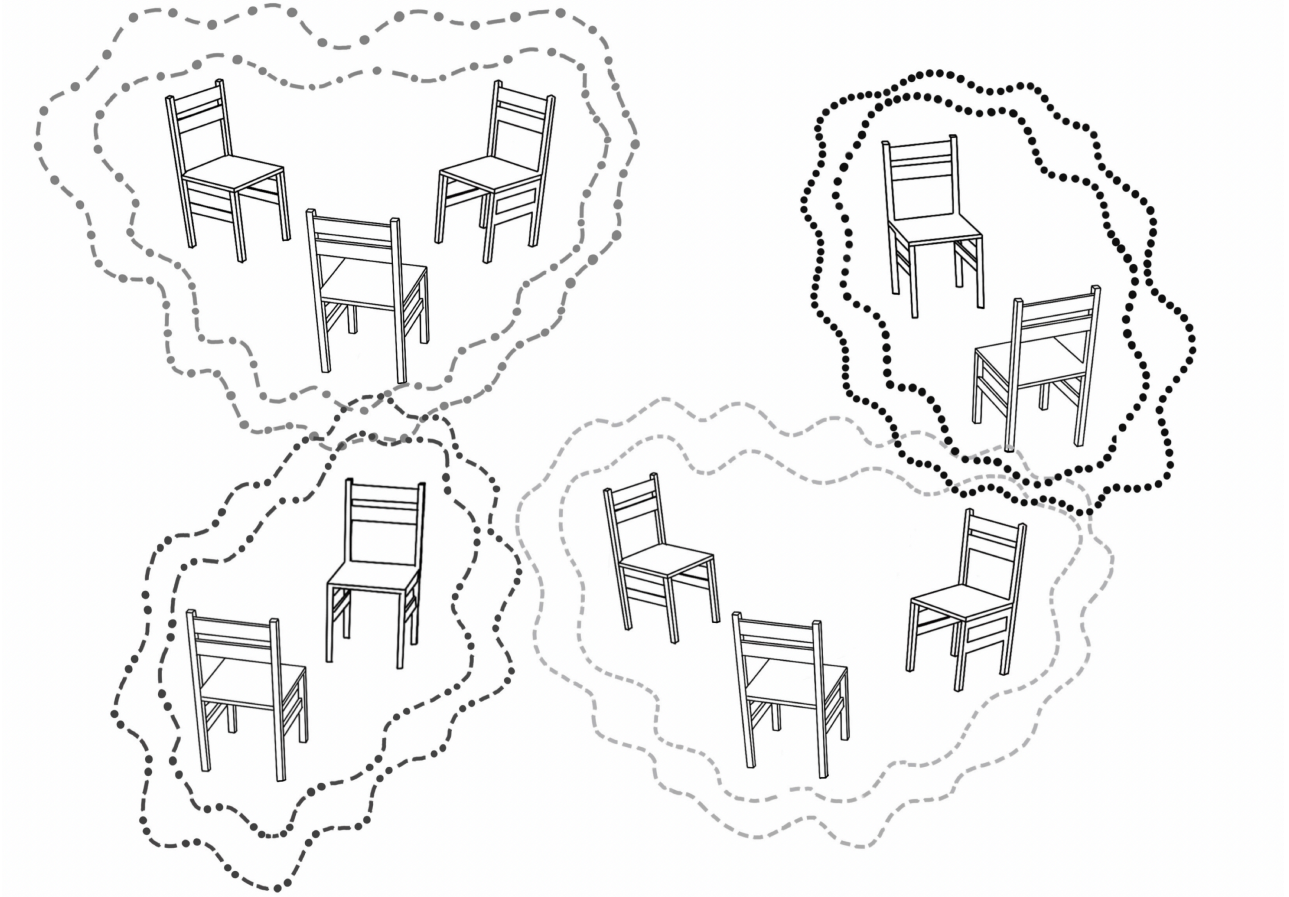
ensemble splits into groups (decide in advance)
dynamic range: mf — ppp, dynamics vary constantly. masker group is always slightly under signal group. Be aware that by the signal group becoming quieter, the masking threshold for the masker group is altered.
masker group: may enter pontillistic or sustained sounds with silences, signal group: remains constant at low activity level
everyone need not play all the time
ends when signal group stops completely

frequency selective temporal masking

as above, but ensemble groups remain in similar critical bands. Masked group leads frequency range.

Contralateral Masking

masking groups/partners are determined by the ensemble seating arrangements, groups no more than 3.



"the cocktail party effect"

as above. ensemble dynamics ff, duets form with neighboring player. Try to interact with your partner in the midst of the din.

thanks to Chloe Seaton for the graphic help!

Thresholds (for Richard Teitelbaum)

Players choose the following at will:
Threshold Group: *Col Legno* or elsewise at the Threshold of Inaudibility—should barely be perceptible. The sounding environment determines the threshold of audibility—therefore, the score for this section is the sounding environment. The threshold group must listen to the sounding environment—yet at the same time as they play, they increase the sounding environment. Vary Register at will; keeping in mind audibility may change with pitch regions
Freedom Group: improvise, dynamic range mf —> ppp.
Silence Group: ...

Approximate Ratios of Proportions:
20-40% Freedom, 40-60% Threshold, 20-40% Silence
note: as ensemble dynamic level increases, players in 1) should increase dynamics.

Thresholds Again

Do not practice this song in advance—wait until hearing the sounding environment—concert hall & associated architecture—such as halls, foyer, and outside the venue.

Begin to record this space, using a variety of field recorders. Make sure no voices or intentional sound is on the tape—try to focus on the resonance of the spaces surrounding you. Tapes can be of any length. Explore different gain structures, even different EQ, try to hear the range of sounds inside the space.

Play back these sounds in space using one speaker per recorder. Dynamic range can vary, or be manipulated live. Ensemble improvises inside this texture at the threshold of audibility. Louder tape part encourages ensemble to play more freely (loudly).

Edging (Misophonia Spell)

Prepare in advance tapes, records, or sound-files. Make decisions on content based on something you want to listen to, that feels really good, and makes you relaxed. Program content must not be music or discernable speech. Listen together as ensemble to have awareness over the program material.

Section 1

Begin this song with program material at zero. Sequentially fade in tape until you achieve a sound level that is "comfortable", and begin playing. Ensemble ends in unison.

Section 2

Repeat previous section, but program material should now be a step beyond what is "comfortable"

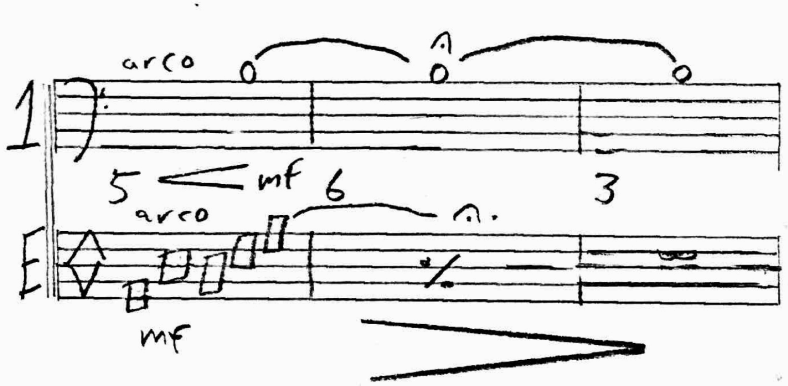
Section 3

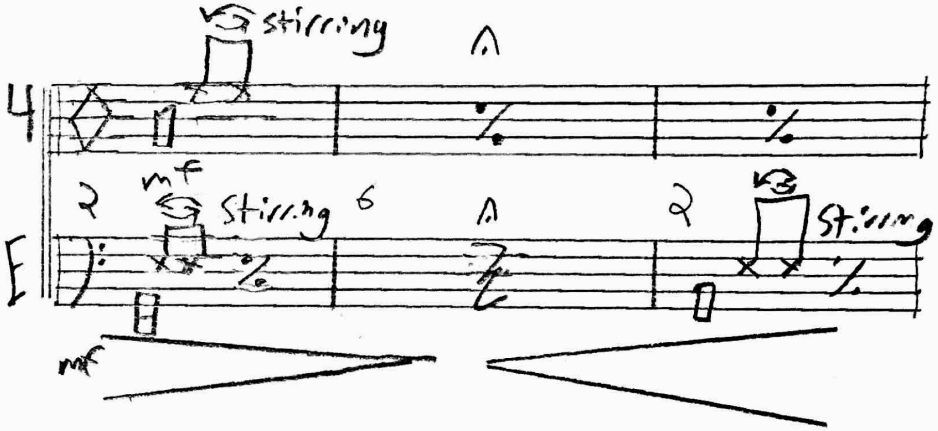
Repeat previous section, but program material should be yet even a little more beyond what is "comfortable"

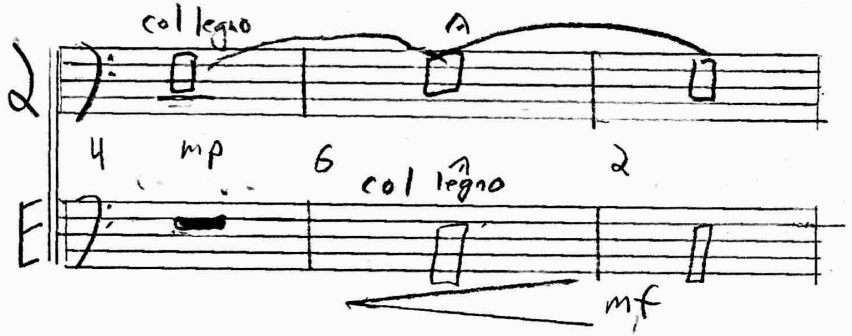
Pitched Edging (Dark Misophonia Spell)

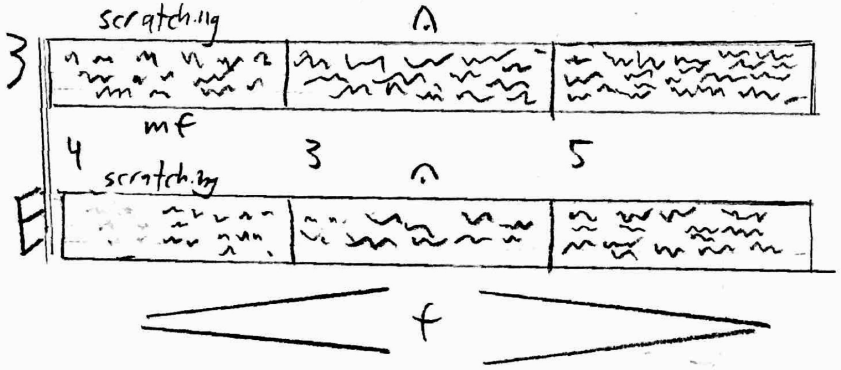
As above, but program material should be pitchy, either directly pitched material or extant program material sent through a resonant filter.

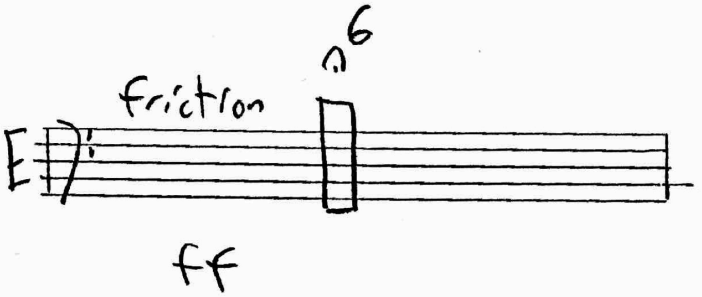
Excitation Patterns

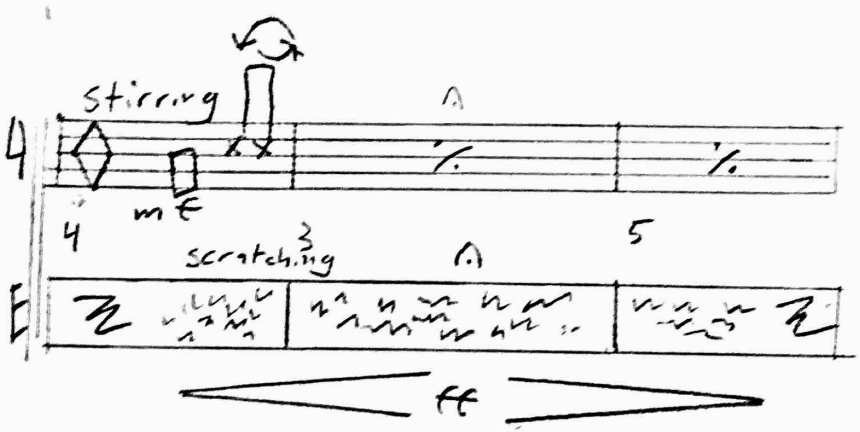


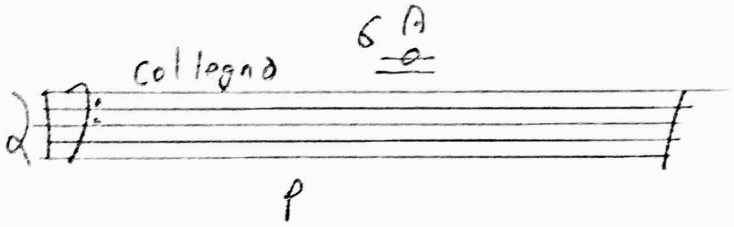


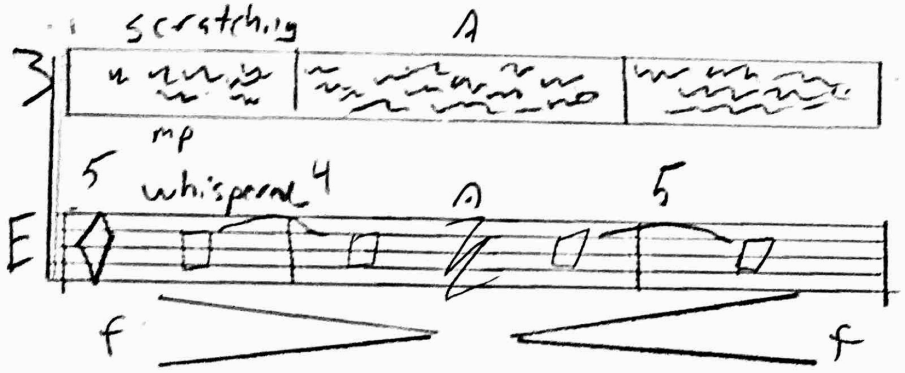


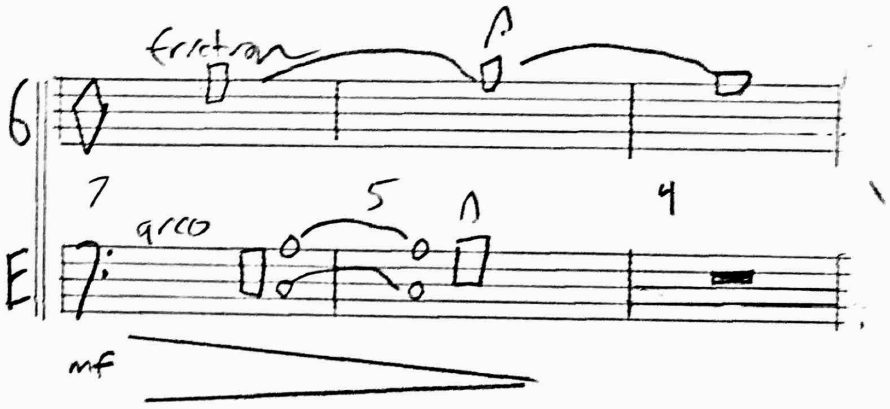


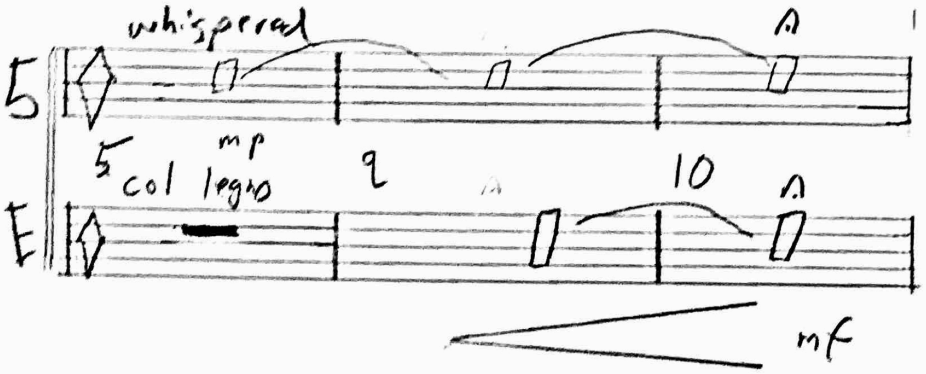


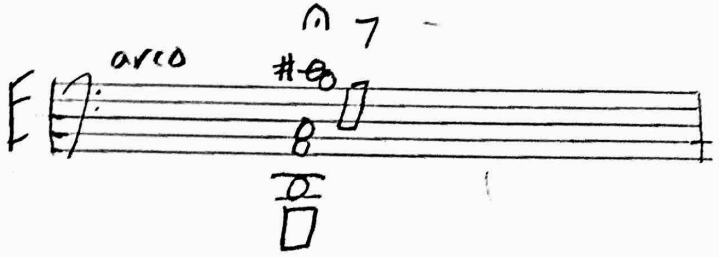

stirring
mf
scratching
ff

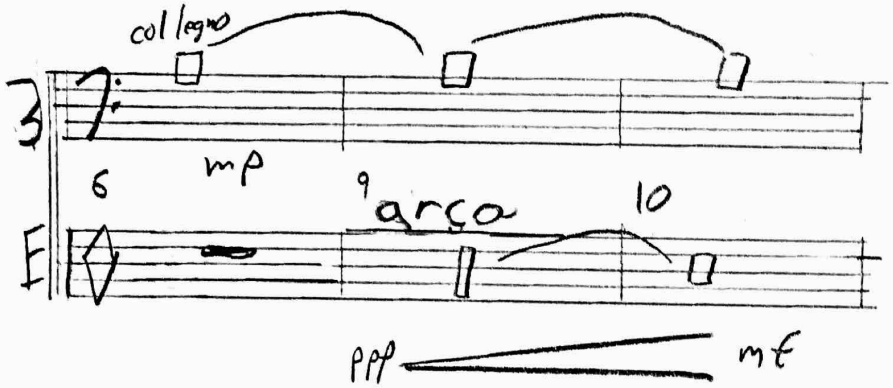

col legno
p

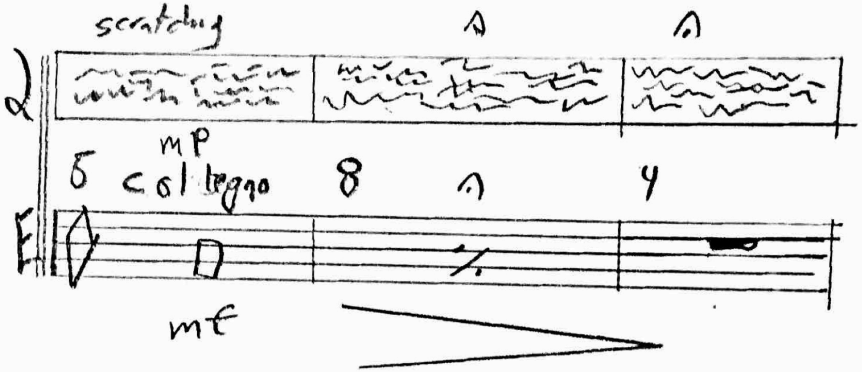

scratching
mp
whisperal
f
f

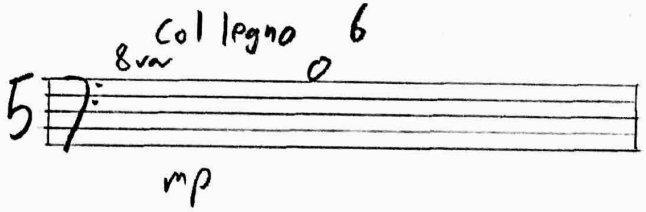

friction
arco
mf


whisperal
mp
col legno
mf


arco


col legno
3
6
mp
9
arco
10
E
ppp
mf


scratching
2
mp
5
col legno
8
4
E
mf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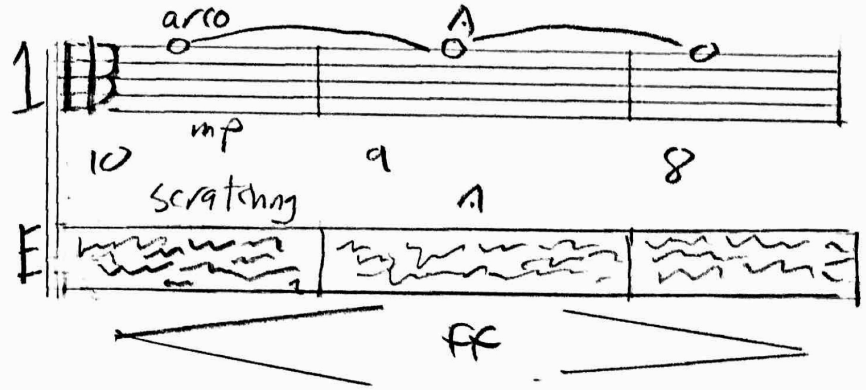
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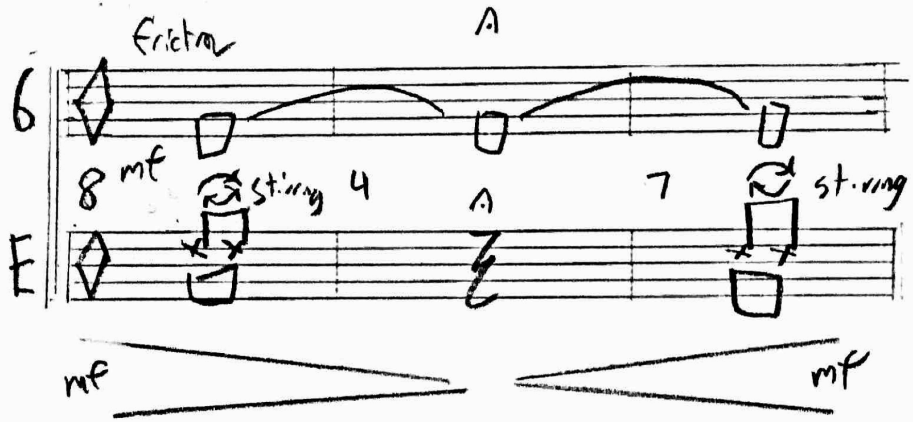
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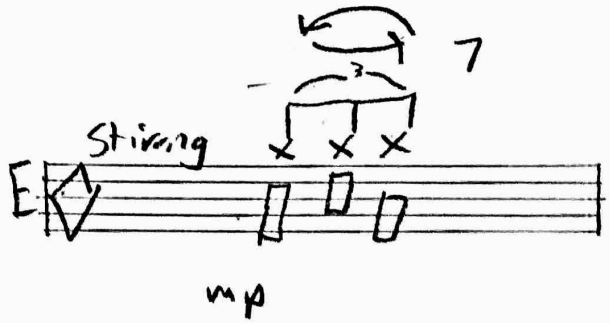
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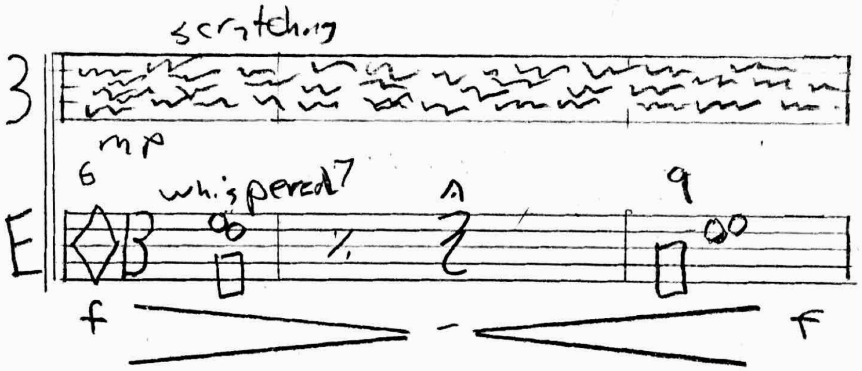
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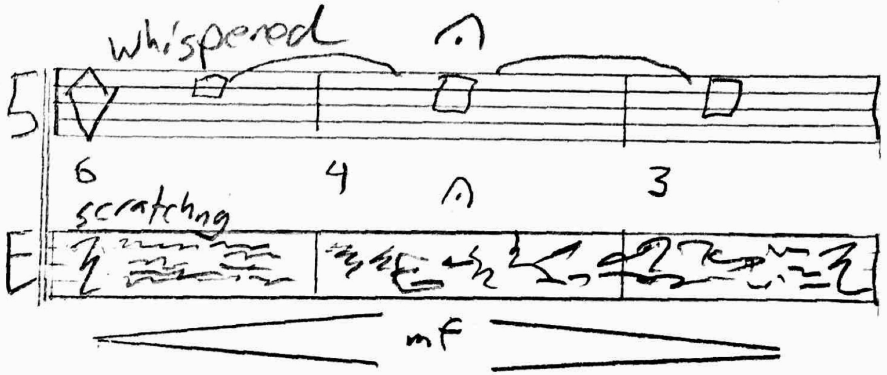
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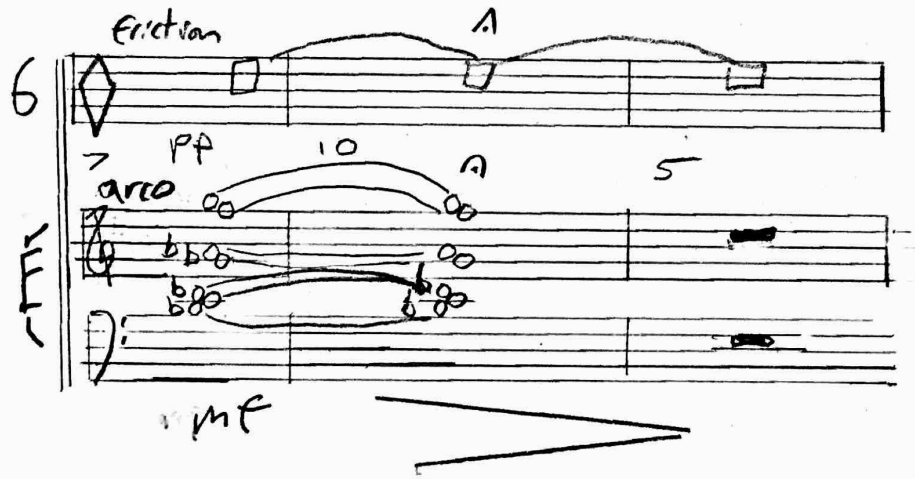
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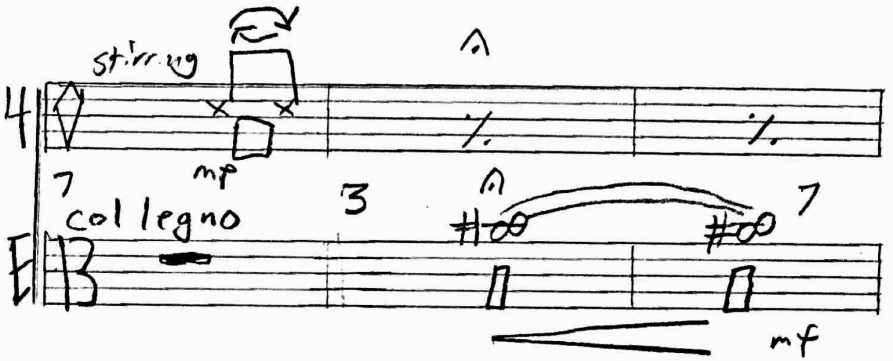
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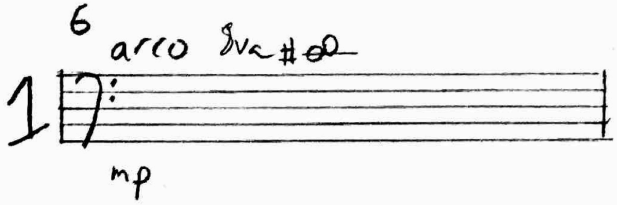
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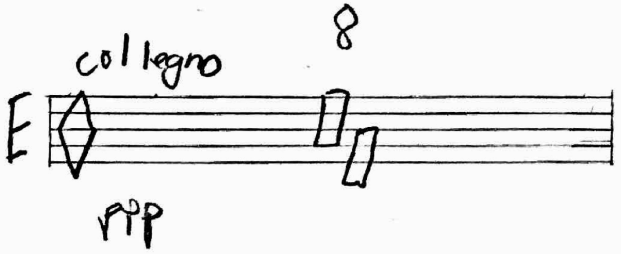
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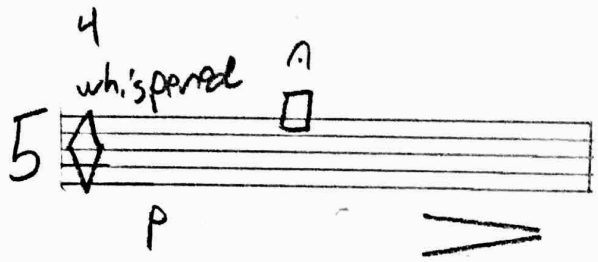
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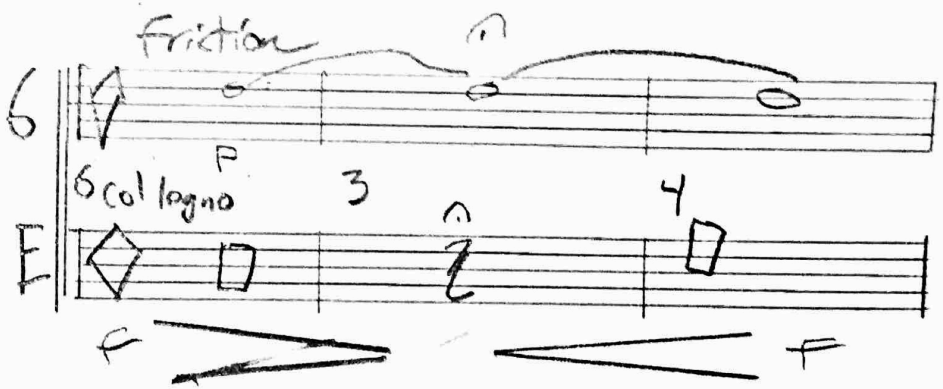
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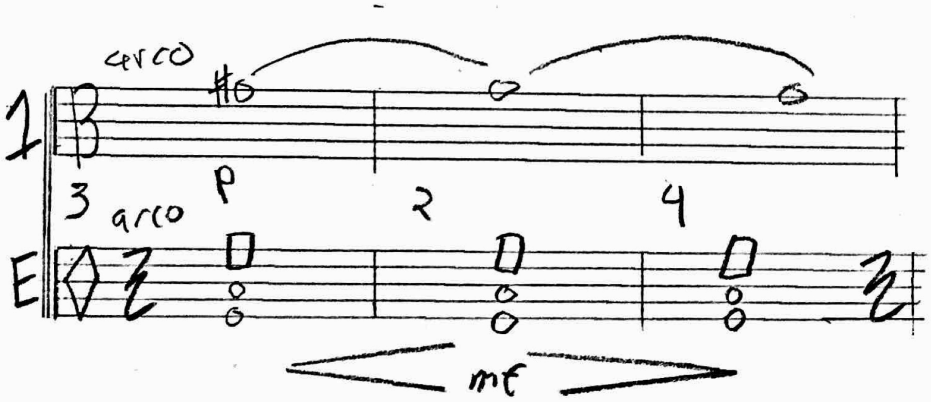
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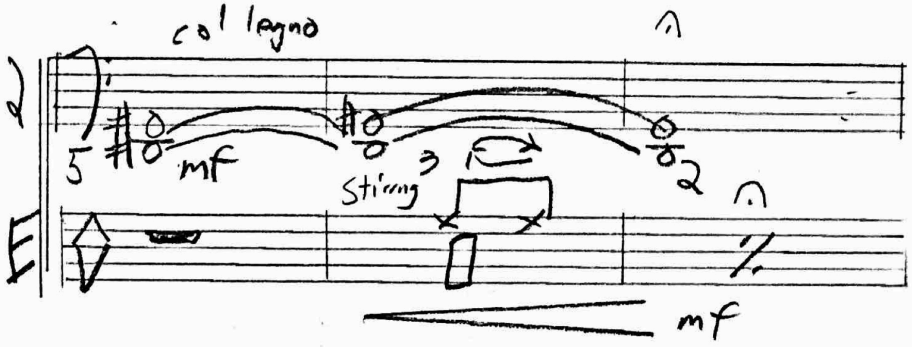
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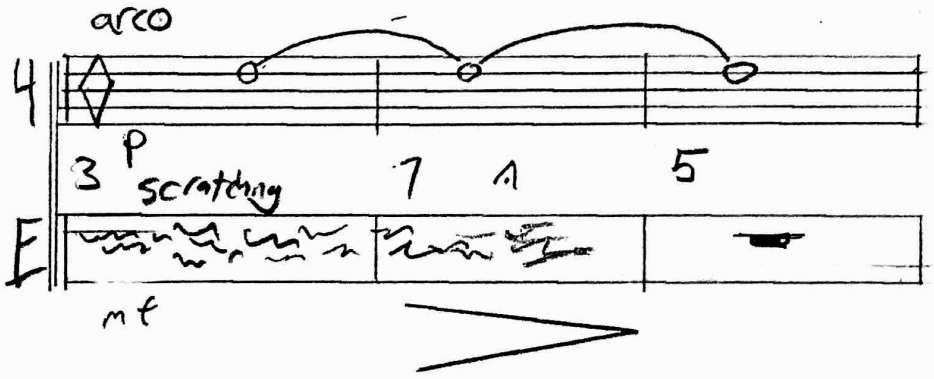
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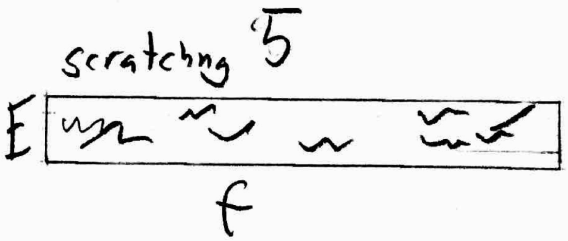
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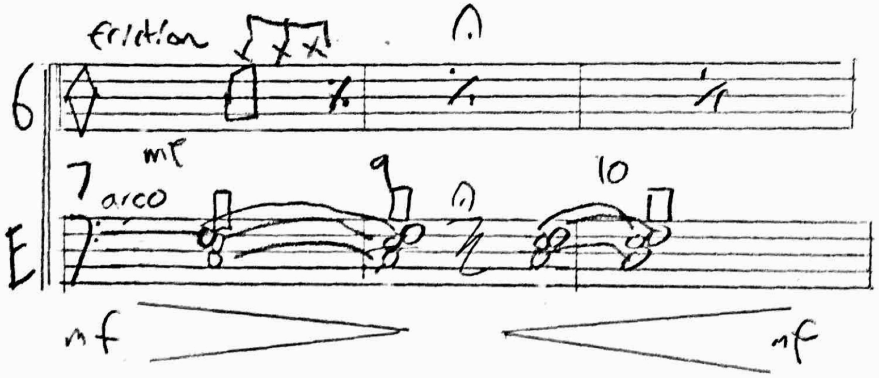
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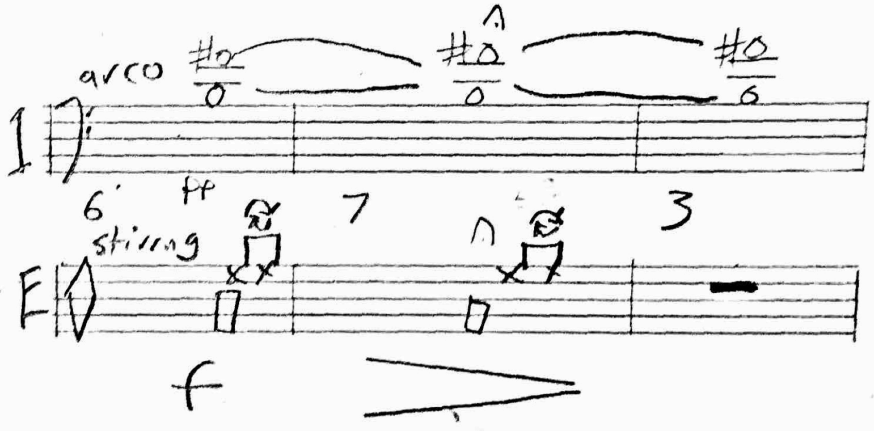
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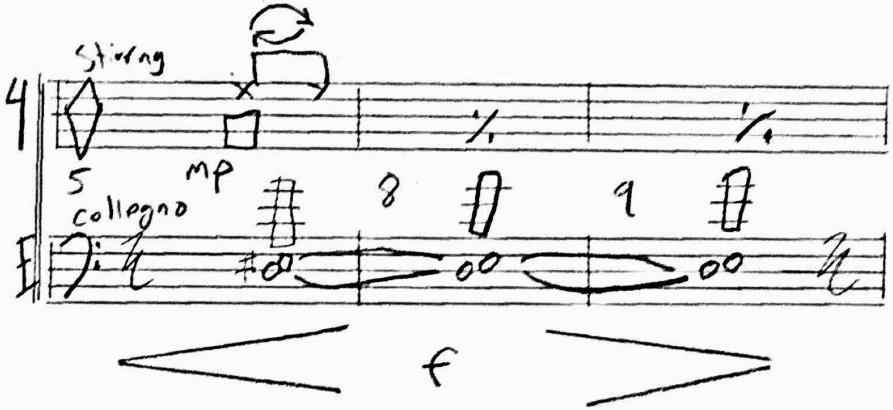
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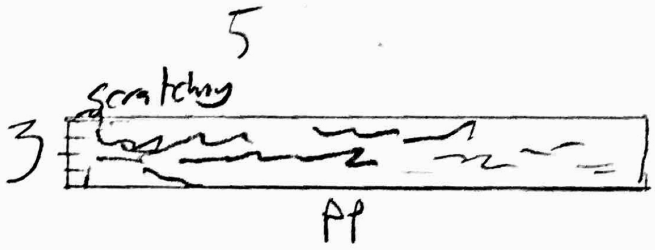
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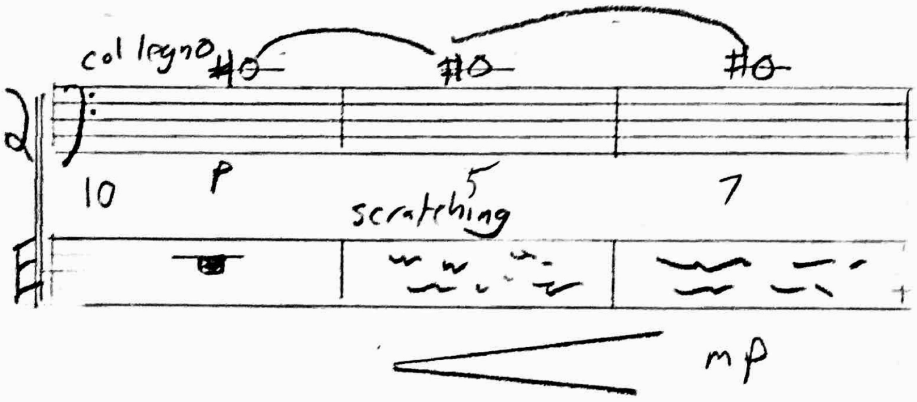
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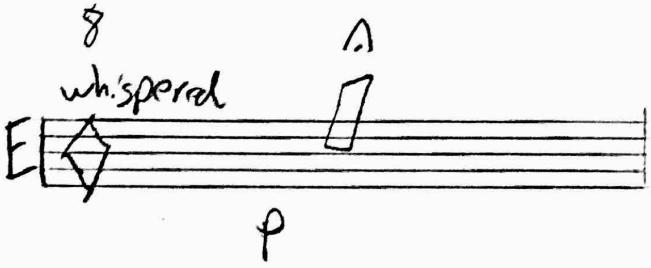
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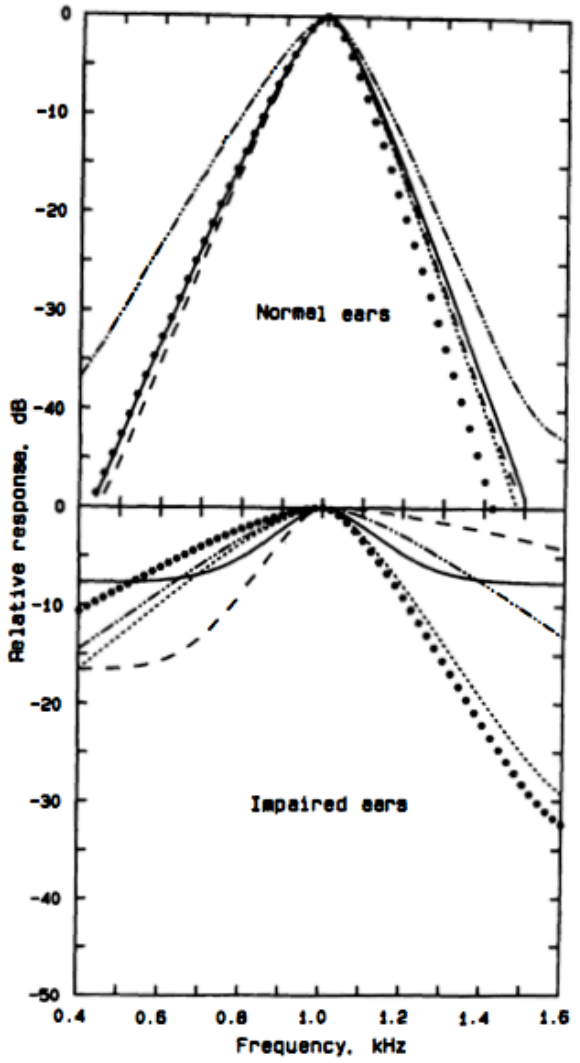

Daniel Fishkin, 2022