

seeds and ledgers 1–3
for string quartet

dedicated to lucie, cat, and ira, respectively

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(berlin and cdmx; 2023–2024)

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Description (which can optionally be used/adapted as a program note)

seeds and ledgers 1–3 explore the reconciliation of distance in harmonic space, generally referred to as ‘consonance’ or ‘dissonance’, and melodic movement in pitch space, generally referred to as a difference in ‘height’. Distance in harmonic space is measured as a complexity function on the frequency ratio between two tones: the higher the quantity and size of the prime factors needed to express the numbers in the frequency ratio, the more dissonant the relationship. Distance in pitch space is typically measured as the log of a frequency ratio and is often expressed in semitones or cents (100th of a tempered semitone). For example, the perfect 5th (a frequency ratio of 3/2) is one of the closest intervals in harmonic space but relatively far (7 semitones) in pitch space. On the contrary, tones that are distance in harmonic space often represent smaller melodic and chromatic differences/movements in pitch space.

These pieces were generated using custom software that maintains ‘compact sets’ (consonant groups of tones) in harmonic space among any simultaneously sounding tones, but favors smaller steps when one voice moves melodically. This is essentially a sort of ‘voice leading’, which is a term often used in the tradition of western classical music.

A compact set is defined as a group of notes such that each note in the group is close in harmonic space to some other note in the group. But when one voice moves, the program will favor notes that move by a smaller step in pitch space from itself while transitioning to another compact set among all the tones.

Any individual part would be near impossible to play by itself. However, because compact sets are always maintained, each successive tone within a part can always be tuned via a relatively simple interval in harmonic space to a tone that is already sounding in one of the other instruments. As a result of this process, some of the passages have an almost baroque, contrapuntal feel; a chromatic drift in harmonic space constantly modulating.

Tuning

Each written note indicates the closest pitch in twelve-tone equal temperament with a cents-deviation (100th of a tempered semitone) provided above.

A Roman numeral with an Arabic superscript followed by an up or down arrow is most often provided below each note. The Roman numeral indicates the reference part against which the current note (which will be called the *referencing note* from here on) can be tuned by a relatively simple interval from a recently or currently sounding pitch in the reference part (which will be called the *reference pitch* from here on). The Arabic superscript and the corresponding arrow indicate the exact interval, up or down, of the referencing note from the reference pitch. Generally, the reference pitch is initiated prior and continues to sound when it is referenced. Occasionally, the reference pitch terminates in the beat prior to the initiation of the referencing note. As a courtesy, this is indicated by a ‘<’ preceding the Roman numeral below the referencing note.

No indication below a note means that it is the same pitch as the prior note within the respective part.

A Roman numeral with a superscript of 1 below a referencing note means that it is an octave equivalent of the reference pitch.

A Roman Numeral with a superscript of 3, 5, 7, 11, or 13 followed by an up arrow indicates that the pitch of the referencing note is a frequency ratio of a 3/2, 5/4, 7/4, 11/8 or 13/8, respectively, from the reference pitch if the reference pitch were transposed to the nearest octave *below* the pitch of the referencing note.

A Roman Numeral with a superscript of 3, 5, 7, 11, or 13 followed by a down arrow indicates that the pitch of the referencing note is a frequency ratio of a $2/3$, $4/5$, $4/7$, $8/11$ or $8/13$, respectively, from the reference pitch if the reference pitch were transposed to the nearest octave *above* the pitch of the referencing note. That is, the down arrow is the inversion of an up arrow and it could alternatively be understood that the referencing note is a frequency ratio of $4/3$, $8/5$, $8/7$, $16/11$, or $16/13$, respectively, from the reference pitch if the reference pitch were transposed to the nearest octave *below* the pitch of the referencing note.

Tempo and Duration

Each of the pieces may be played individually, but it is preferred that they are all played together in sequence.

Pieces 1 and 2 are written with a $2/2$ time signature and should be played at a tempo such that a half note is approximately 60 beats per minute (2 seconds per measure).

A fermata with a number directly below is a suggestion for the number of seconds the notes in that measure can be held. It is actually the exact number of seconds that the computer program that generated the piece assigned to the measure, but may be interpreted more freely by the ensemble.

Piece 3 is much more open. Note durations are not provided until measure 105. Up until measure 105, durations between the initiation of one note to the next among the parts should generally be 1 to 2 seconds. However, that is more of a lower limit. The performer initiating the next note has discretion to maintain the current chord for (potentially much) longer such that the more consonant the chord subjectively, the longer it sounds. Within a part, each tone should generally be held until the next tone, but the given performer can also fade out and rest a moment before initiating the next tone.

Time signatures and note durations are only provided for the end of piece 3 (measures 105 to 114) and an optional coda (starting at measure 115). Like pieces 1 and 2, the ending and the coda of piece 3 should be interpreted with a tempo such that a half note is approximately 60 beats per minute.

Optional Coda

Given that the coda of piece 3 starting at measure 115 is exceedingly difficult, it is optional. Good luck to any group that attempts it and congratulations in advance to any group who successfully executes it!

Generating programs

These pieces were generated using custom software written in SuperCollider with a front-end user interface written in Javascript called Open Stage Control. These programs can also be used to audition the pieces and each individual part. The most recent version of the code along with any utilities that are developed are downloadable from a git repository at: https://unboundedpress.org/code/mwinter/seeds_and_ledgers

The generation of this document (using LaTeX) contains a version date at the bottom of this page in order to help track changes and the git repository will also detail commit changes. The piece was last generated using SuperCollider version 3.13 and Lilypond version 2.24.1.

seeds and ledgers 1

for lucie nezri

michael winter
(berlin; 2023-24)

First system of musical notation (measures 1-6). The system consists of four staves (I, II, III, IV) in 2/2 time. Staff I contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes. Staff II contains a sustained note with a +0 interval. Staff III is empty. Staff IV contains a sustained note with a +0 interval.

Second system of musical notation (measures 7-12). The system consists of four staves (I, II, III, IV) in 2/2 time. Staff I contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes. Staff II contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes. Staff III contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes. Staff IV contains a sustained note with a +47 interval.

Third system of musical notation (measures 13-18). The system consists of four staves (I, II, III, IV) in 2/2 time. Staff I contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes. Staff II contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes. Staff III contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes. Staff IV contains a melodic line with various intervals and ledger lines, with fingerings indicated by numbers above the notes.

20

Staff I: Treble clef, whole notes, ledger lines. Fingerings: I 7↑, I 3↑, I 11↑, I 3↓.

Staff II: Treble clef, eighth notes, ledger lines. Fingerings: I 7↑, I 3↑, I 11↑, I 3↓.

Staff III: Bass clef, whole notes, ledger lines.

Staff IV: Bass clef, eighth notes, ledger lines. Fingerings: II 13↑, I 5↓, II 1, I 11↓, I 13↑.

27

Staff I: Treble clef, whole notes, ledger lines. Fingering: IV 1.

Staff II: Treble clef, eighth notes, ledger lines. Fingering: III 1.

Staff III: Bass clef, eighth notes, ledger lines. Fingering: I 1, II 7↑.

Staff IV: Bass clef, eighth notes, ledger lines. Fingering: III 13↑, III 3↑, III 3↓, III 5↑, III 7↓, II 1, II 13↓.

34

Staff I: Treble clef, whole notes, ledger lines. Fingering: IV 1, II 11↑, II 5↓.

Staff II: Treble clef, whole notes, ledger lines.

Staff III: Bass clef, eighth notes, ledger lines. Fingering: II 5↓, II 13↑, II 3↑.

Staff IV: Bass clef, eighth notes, ledger lines. Fingering: II 5↑, I 5↓, III 5↓, II 7↓, I 13↑, II 1, III 11↑.

43

-20 +14 +49 -49 6 4

III 7↓ IV 5↓ III 1 IV 11↑

-2 -40 -5 +45 -41

IV 3↓ II 5↓ II 11↓ II 3↓ IV 13↓

52

2

-8 -47 -35 +20 +20

I 13↑ I 3↑ I 5↓ I 7↑

III 13↑ III 3↑ III 11↑ III 11↓

60

-49

IV 1

+49

IV 3↓

+36 +47 -47 -35 +9 -19 +36

II 5↑ II 3↓ IV 3↑ IV 5↓ II 13↓ II 7↓ II 5↑

+18 +6 -49

III 3↓ III 5↑ III 7↓

68

Staff I: +36, +47, +9, -19
 II 5[↑], II 3[↓], II 13[↓], II 7[↓]

Staff II: +49, +38, +11
 IV 5[↑], IV 13[↓]

Staff III: +47, -10, +18, -19, +47, -49
 II 3[↓], II 13[↑], II 7[↑], II 7[↓], II 3[↓], IV 1

Staff IV: +18, -37, -49
 II 7[↑], II 5[↓], II 3[↑]

76

Staff I: -19
 II 7[↓]

Staff II: +3, -6, -18, +21, +49, +11, +49
 IV 11[↑], I 5[↓], IV 7[↓], I 13[↑], IV 3[↓], IV 13[↓], III 3[↓]

Staff III: (Empty)

Staff IV: -21, -18, -20, +29
 I 3[↓], III 7[↓], II 7[↑], I 11[↓]

83

Staff I: 2, 8, -19

Staff II: -33, -21, +40
 I 5[↑], I 3[↓], I 13[↓]

Staff III: +49
 I 7[↑]

Staff IV: +32, -10, -37, -49, -21, +29
 I 11[↑], II 13[↑], II 5[↓], III 1, I 3[↓], I 11[↓]

93

Measure 93: I 11[↑] +32, II 11[↑] +32, III 11[↑] +32, IV 11[↑] +32

Measure 94: I 13[↑] +21, II 13[↑] +21, III 13[↑] +21, IV 13[↑] +21

Measure 95: I 5[↓] -6, II 5[↓] -6, III 5[↓] -6, IV 5[↓] -6

Measure 96: I 11[↑] +32, II 11[↑] +32, III 11[↑] +32, IV 11[↑] +32

Measure 97: I 11[↓] +29, II 11[↓] +29, III 11[↓] +29, IV 11[↓] +29

Measure 98: I 13[↑] +21, II 13[↑] +21, III 13[↑] +21, IV 13[↑] +21

Measure 99: I 1[↑] -6, II 1[↑] -6, III 1[↑] -6, IV 1[↑] -6

Measure 100: I 3[↑] -18, II 3[↑] -18, III 3[↑] -18, IV 3[↑] -18

101

Measure 101: I 7[↓] +12, II 7[↓] +12, III 7[↓] +12, IV 7[↓] +12

Measure 102: I 3[↑] -18, II 3[↑] -18, III 3[↑] -18, IV 3[↑] -18

Measure 103: I 7[↑] +49, II 7[↑] +49, III 7[↑] +49, IV 7[↑] +49

Measure 104: I 1[↑] -19, II 1[↑] -19, III 1[↑] -19, IV 1[↑] -19

Measure 105: I 13[↑] +19, II 13[↑] +19, III 13[↑] +19, IV 13[↑] +19

Measure 106: I 1[↑] +12, II 1[↑] +12, III 1[↑] +12, IV 1[↑] +12

Measure 107: I 13[↓] +40, II 13[↓] +40, III 13[↓] +40, IV 13[↓] +40

Measure 108: I 7[↓] +25, II 7[↓] +25, III 7[↓] +25, IV 7[↓] +25

109

Measure 109: I 11[↓] +29, II 11[↓] +29, III 11[↓] +29, IV 11[↓] +29

Measure 110: I 11[↑] +32, II 11[↑] +32, III 11[↑] +32, IV 11[↑] +32

Measure 111: I 5[↑] -33, II 5[↑] -33, III 5[↑] -33, IV 5[↑] -33

Measure 112: I 7[↓] +12, II 7[↓] +12, III 7[↓] +12, IV 7[↓] +12

Measure 113: I 7[↑] +49, II 7[↑] +49, III 7[↑] +49, IV 7[↑] +49

Measure 114: I 3[↑] -18, II 3[↑] -18, III 3[↑] -18, IV 3[↑] -18

Measure 115: I 11[↑] +32, II 11[↑] +32, III 11[↑] +32, IV 11[↑] +32

Measure 116: I 5[↓] -4, II 5[↓] -4, III 5[↓] -4, IV 5[↓] -4

116

IV 5↓ III 13↓

+42 -6 +38 -18

I 13↓ IV 3↑

-21 -19

126

-23 +30 +10 -21 -19

III 3↓ III 11↑ III 7↓

137

+27 -19 +38 -21 -19

III 11↓ IV 1 III 13↓

148

III 5↓ IV 7↓

IV 5↓

III 13↑ III 3↑

III 7↓ III 5↑

II 3↓

158

III 13↑ III 3↑

III 7↓ III 5↑

II 3↓

167

IV 1 IV 7↑

IV 5↓

II 13↑ II 3↑ IV 13↓

II 5↑ II 7↓

179

IV 3^{\uparrow}

IV 5^{\uparrow} IV 3^{\downarrow} IV 11^{\downarrow} IV 5^{\downarrow}

-2 -2 -18 -6 +45 +10 -4

184

I 13^{\uparrow} II 7^{\uparrow} IV 13^{\downarrow} II 3^{\uparrow} I 11^{\uparrow}

+5 -33 -44 +0 +16 -35

194

IV 7^{\uparrow} IV 13^{\uparrow} IV 11^{\uparrow} III 7^{\downarrow} I 11^{\uparrow} II 5^{\downarrow} II 3^{\uparrow}

-31 +41 -49 +47 +16 -39 +0

203

II +42
I 3↑

III +49
II 3↑

IV +39
I 3↓

+42
II 1

-8
I 11↑

-19
III 7↓

211

I +41

II -46
I 5↓

-49
III 3↑

+1
IV 11↑

III +49

IV +49
III 1

219

I +41

II -11
I 11↓

+36
III 5↑

+47
IV 3↓

+39
I 3↓

III +49

IV +49

+49
III 1

+18
III 7↑

228

228

I

II

III

IV

2

+41

+9 -49

III 13↓ IV 3↑

+0 +36 +47

I 13↓ III 5↑ IV 3↓

+49

+49 -10

III 1 III 13↑

+49 +18 -37

III 1 III 7↑ III 5↓

236

236

I

II

III

IV

4

+41

+9 -2 +47 +9

I 7↑ III 11↓ IV 3↓ III 13↓

+49

+49 +18 -37

III 1 III 7↑ III 5↓

245

245

I

II

III

IV

2

+41

-37 +1

III 5↓ III 11↑

-46 +47 -49 -10 +18

I 5↓ III 3↓ III 3↑ III 13↑ III 7↑

+49

+49 +18 -10 -2

III 1 III 7↑ III 13↑ III 11↓

(254)

Staff I: +29, -2, -16, III 1, IV 1, III 1

Staff II: -4, -33, +49, +39, IV 3 \downarrow , IV 7 \uparrow , IV 11 \uparrow , IV 13 \uparrow

Staff III: +29, -2, -16, -2, -2, IV 7 \downarrow , IV 1, IV 5 \uparrow , IV 1

Staff IV: -2, +39, +0, +39, -33, III 13 \uparrow , III 3 \uparrow , III 13 \uparrow , III 7 \uparrow

(261)

Staff I: -31, +26, +5, -13, +36, IV 3 \uparrow , IV 13 \downarrow , II 7 \uparrow , II 11 \uparrow , II 1

Staff II: +36, IV 7 \uparrow

Staff III: -47, +26, +36, +18, -35, -24, +5, +22, IV 5 \uparrow , IV 13 \downarrow , II 1, IV 11 \uparrow , IV 3 \downarrow , II 13 \uparrow , II 7 \uparrow , II 5 \uparrow

Staff IV: +38, +36, II 3 \uparrow , II 1

seeds and ledgers 2

for cat lamb

michael winter
(berlin; 2023)

First system of the musical score, measures 1-6. The score is for four staves (I, II, III, IV) in 2/2 time. Staff I (treble clef) has notes with intervals +0, -14, -41, and +6. Staff II (treble clef) has notes with intervals -14, -41, and -2. Staff III (bass clef) has notes with intervals +49, +2, and +14. Staff IV (bass clef) has a whole note with interval +0. Roman numerals IV 1, IV 5↑, and IV 13↓ are indicated below the staves.

Second system of the musical score, measures 7-12. The score continues with four staves. Staff I has notes with intervals +0, -14, -41, and +16. Staff II has notes with intervals -14, -41, and -2. Staff III has notes with intervals +46, +29, +49, +2, and +14. Staff IV has notes with intervals -27, +47, and +0. Roman numerals I 5↑, II 7↓, IV 11↓, IV 3↑, IV 5↓, I 5↓, II 11↓, and < II 3↑ are indicated below the staves.

Third system of the musical score, measures 13-18. The score continues with four staves. Staff I has notes with intervals +16, +2, and +2. Staff II has notes with intervals +47, -25, +14, +2, +16, and -16. Staff III has notes with intervals -16, -36, and +18. Staff IV has notes with intervals -44 and +0. Roman numerals I 7↓, I 13↓, I 3↓, I 5↑, I 1, I 7↑, II 5↑, I 11↓, I 3↑, and I 13↑ are indicated below the staves.

35

+44 2 -29 2 -17 +36 2 +33 -14 -2 2

II 13↓ II 5↑ II 3↓ II 11↑ II 11↓ II 3↑ II 5↓

45

+25 -47 2 +44 2 -17 4 +20 2 +31

II 13↑ II 7↑ II 13↓ II 3↓ III 3↑ IV 5↓

IV 13↓

7 +18 II 1

-47 +18 II 7↑ III 1

55

-42 -14 2 2 4 2

IV 13↑ IV 7↑

+16 IV 3↓

+46 -27 -16 +38

I 13↓ I 5↑ I 3↓ I 11↑

66

IV 5[↑]

IV 1

IV 11[↓]

I 11[↓] I 3[↑] I 13[↑] I 5[↓] I 3[↑]

77

IV 13[↓] IV 7[↑] IV 7[↑] IV 13[↑] IV 3[↑] IV 5[↓] IV 1

IV 3[↓] IV 3[↓]

IV 3[↑]

87

II 5[↓] III 1 III 13[↑]

III 1

II 7[↓] IV 1 II 11[↑]

II 5[↓] II 13[↑] III 3[↑] III 11[↓]

(96)

Measure 96: I (III 13↓, III 7↓, III 5↑), II, III (II 3↓, I 13↑, I 5↓, IV 1), IV (II 11↑, III 1, II 5↑, III 7↑, I 13↑, I 3↑, I 11↓, I 11↑, III 7↑).

Measure 97: I (-25, +47, +35), II (-11, III 13↑), III (+16, -13, -39, +49), IV (-31, +16, +4, -16, -13, +49, -5, -2, +18).

Measure 98: I, II, III, IV.

Measure 99: I, II, III, IV.

Measure 100: I, II, III, IV.

Measure 101: I, II, III, IV.

(102)

Measure 102: I (IV 1, III 13↑, II 1, IV 1, IV 1, II 11↑), II (-38, -49), III (+37, +10, +37), IV (-3, -47, -1, +2, +49, +10).

Measure 103: I, II (III 5↓, III 3↑), III (II 5↑, II 13↓, II 5↑), IV (III 11↓, II 3↑, II 11↓, I 1, II 3↓, III 1).

Measure 104: I, II, III, IV.

Measure 105: I, II, III, IV.

Measure 106: I, II, III, IV.

Measure 107: I, II, III, IV.

(108)

Measure 108: I (III 13↓, III 5↑, III 3↓, III 11↑, IV 11↓), II (+4, +16, +43, -29, +4, +16), III (+49, +2), IV (-18).

Measure 109: I, II (III 3↑, III 5↓, III 13↑, III 7↑, III 3↑, III 5↓), III (II 3↓, I 1), IV (II 7↓).

Measure 110: I, II, III, IV.

Measure 111: I, II, III, IV.

Measure 112: I, II, III, IV.

Measure 113: I, II, III, IV (< II 1).

119

Staff I: +18 $\frac{4}{4}$ IV 3^{\uparrow} +29 IV 5^{\downarrow} 2 IV 1 +16 $\frac{4}{4}$ IV 13^{\uparrow} -44 IV 7^{\uparrow} -15 IV 1 +16

Staff II: -25 IV 13^{\downarrow} +14 IV 3^{\downarrow} +2 IV 5^{\uparrow} +14 IV 3^{\downarrow} -33 IV 11^{\uparrow} -36 IV 11^{\downarrow}

Staff III: +2 IV 5^{\uparrow} -25 IV 13^{\downarrow} +18 IV 3^{\uparrow} +29 IV 5^{\downarrow} -25 IV 13^{\downarrow} +2 IV 5^{\uparrow}

Staff IV: +16

127

Staff I: $\frac{4}{4}$ 8 2 +16 $\frac{4}{4}$ -44 IV 1 IV 13^{\uparrow} -15 IV 7^{\uparrow} +16 IV 1 +2 IV 5^{\uparrow}

Staff II: +2 IV 5^{\uparrow} +14 IV 3^{\downarrow} -33 IV 11^{\uparrow} -36 IV 11^{\downarrow} +18 IV 3^{\uparrow}

Staff III: +18 IV 3^{\uparrow} +29 IV 5^{\downarrow} -25 IV 13^{\downarrow} +2 IV 5^{\uparrow} +14 IV 3^{\downarrow}

Staff IV: +16

140

Staff I: $\frac{4}{4}$ +14 IV 3^{\downarrow} 8 2 -33 IV 11^{\uparrow} -36 IV 11^{\downarrow}

Staff II: -44 IV 13^{\uparrow} +14 IV 3^{\downarrow} -33 I 1

Staff III: +29 IV 5^{\downarrow} -15 IV 7^{\uparrow} +2 IV 5^{\uparrow}

Staff IV: +16

151

Interval markings for measures 151-158:

- Staff I: +18, -44, -15
- Staff II: -36, +47, -25
- Staff III: -25, +14, -33
- Staff IV: (no markings)

159

Interval markings for measures 159-166:

- Staff I: +16, +18, -36, +14
- Staff II: +14, -33, +2, +14
- Staff III: -36, +2, -25, +29
- Staff IV: +16

172

Interval markings for measures 172-179:

- Staff I: +18, -36, +14, +2, -25
- Staff II: -33, +2, +14, +47, +16
- Staff III: +2, -25, +29, -44, -15
- Staff IV: +16

seeds and ledgers 3

for irasema fernandez

michael winter
(berlin; 2023-24)

The musical score is written for five voices (I, II, III, IV, and V) across three systems. Each voice part is represented by a staff with a specific clef and key signature. The notation includes pitch bends (indicated by numbers above or below the notes) and fingering numbers (indicated by small numbers above or below the notes). The score is divided into three systems, with the fifth voice (V) starting at measure 15.

System 1 (Measures 1-8):

- Voice I:** Treble clef, key of D major. Notes: D4 (+0), E4 (+2), F#4 (+6), G#4 (-31), A4 (+0), B4 (-2), C5 (+2), D5 (-31). Fingering: II 1, IV 3↑, III 7↑, II 1, IV 3↓, IV 1, IV 7↑.
- Voice II:** Treble clef, key of D major. Notes: E4 (+2), F#4 (+6), G#4 (+0), A4 (+2), B4 (+0), C5 (-2), D5 (+0), E5 (+2). Fingering: IV 3↑, I 1, III 1, III 1, IV 3↑, IV 1, III 1, IV 3↑.
- Voice III:** Bass clef, key of D major. Notes: D4 (+0), E4 (+2), F#4 (+14), G#4 (+0), A4 (+0). Fingering: IV 3↓, IV 5↓, II 1, IV 3↑.
- Voice IV:** Bass clef, key of D major. Notes: D4 (+0), E4 (+4), F#4 (+0), G#4 (-2), A4 (+2), B4 (-2), C5 (+0). Fingering: II 3↑, II 1, I 1, III 3↑, III 3↓, III 1.

System 2 (Measures 9-14):

- Voice I:** Treble clef, key of D major. Notes: D4 (+0), E4 (-12), F#4 (-10), G#4 (+17), A4 (-27), B4 (-12), C5 (-10), D5 (-23). Fingering: IV 1, IV 5↑, IV 1, III 7↓, III 5↑, II 1, III 1, III 5↑.
- Voice II:** Treble clef, key of D major. Notes: E4 (-12), F#4 (-12), G#4 (-8), A4 (+4). Fingering: I 1, IV 3↓, III 3↑, IV 1.
- Voice III:** Bass clef, key of D major. Notes: D4 (+2), E4 (+4), F#4 (-10), G#4 (+2), A4 (-14), B4 (-10). Fingering: II 1, II 3↑, I 3↑, II 1, IV 3↓, IV 3↑.
- Voice IV:** Bass clef, key of D major. Notes: D4 (+0), E4 (-2), F#4 (+2), G#4 (-10), A4 (-45), B4 (-12), C5 (-14), D5 (-10), E5 (-12), F#5 (+4). Fingering: III 1, I 3↓, II 1, III 5↑, III 11↑, I 1, III 1, II 3↑, II 1, III 5↓.

System 3 (Measures 15-21):

- Voice I:** Treble clef, key of D major. Notes: D4 (-8), E4 (-20), F#4 (-10), G#4 (-8), A4 (+42), B4 (+10), C5 (-36), D5 (-21). Fingering: IV 3↑, IV 5↑, III 1, III 11↓, III 3↓, III 1, II 5↑, II 1.
- Voice II:** Treble clef, key of D major. Notes: E4 (-22), F#4 (+42), G#4 (-10), A4 (-45), B4 (+10), C5 (-23), D5 (-34). Fingering: I 5↑, III 11↑, I 1, IV 5↓, I 1, IV 7↑, III 5↑.
- Voice III:** Bass clef, key of D major. Notes: D4 (+43), E4 (+10), F#4 (+42), G#4 (-21). Fingering: IV 11↑, IV 7↑, IV 1, II 3↑.
- Voice IV:** Bass clef, key of D major. Notes: D4 (-10), E4 (-6), F#4 (-23), G#4 (-8), A4 (+30), B4 (+42), C5 (+8), D5 (-38), E5 (-36). Fingering: III 1, I 3↑, III 5↑, III 3↑, III 5↑, I 1, II 3↓, I 3↓, I 1.

22

System 1 (Measures 22-28):

- Staff I:** -38, -36, +50, -38, -36, -21, +26, -23. Intervals: III¹, III^{3↑}, IV^{5↑}, IV^{3↓}, IV^{3↓}, III¹, IV^{11↓}, II¹.
- Staff II:** -23, -38, -34, -36, -34, -23. Intervals: IV^{5↓}, IV¹, III¹, IV¹, IV^{3↑}, III^{5↓}.
- Staff III:** -38, -34, +32, -36, -36, -21, -36, +46, -34. Intervals: IV^{3↓}, IV^{3↑}, IV^{7↑}, IV¹, IV^{3↓}, II^{3↑}, IV^{3↓}, II^{7↑}, IV^{5↑}.
- Staff IV:** -38, -36, -34, -23, -21. Intervals: III¹, I¹, II¹, II¹, II^{3↑}.

29

System 2 (Measures 29-35):

- Staff I:** -36, -33, -21, -34, -21, -19, -36, -33, +10, -23. Intervals: III^{3↓}, IV^{3↑}, IV^{5↓}, II¹, IV^{3↑}, IV^{3↑}, II^{3↓}, III^{7↓}, III^{3↓}, IV^{5↑}.
- Staff II:** -34, -33, -9. Intervals: I^{3↑}, IV^{5↑}, I^{5↓}.
- Staff III:** +50, -19, -33, -23, -21, +46. Intervals: I^{5↑}, I^{5↓}, I¹, I^{3↓}, IV¹, I^{7↑}.
- Staff IV:** -38, -34, -21, -19, +34, -23, -21, -19, -25. Intervals: I^{3↓}, II¹, I¹, III^{5↓}, II^{7↑}, III¹, I¹, I¹, I^{3↓}.

36

System 3 (Measures 36-42):

- Staff I:** -25, -50, -21, -34, -46, -11, -11, -31, +3. Intervals: IV¹, II^{13↓}, IV¹, IV¹, III^{3↑}, IV^{7↑}, III^{3↓}, IV^{11↓}, III^{7↓}.
- Staff II:** -34, -8, -15, -20, -9, +19, -28. Intervals: IV^{5↑}, III^{13↑}, I^{7↓}, IV^{13↓}, I^{3↑}, IV^{3↓}, III¹.
- Staff III:** -23, -23, -48, +34, +7, -28. Intervals: IV^{3↑}, IV^{3↓}, II^{5↑}, IV^{5↓}, IV^{5↑}, IV^{11↑}.
- Staff IV:** -23, -21, -34, -33, +21, +41. Intervals: III¹, III^{3↑}, II¹, II^{3↑}, III^{7↑}, III^{7↑}.

(43)

Measure 43: I (IV 5[↑]), II (+1, I 3[↓]), III (+3, I 1), IV (+17, I 5[↓]).
 Measure 44: I (-31), II (+34, III 7[↓]), III (+0, I 7[↓]), IV (+44, III 13[↑]).
 Measure 45: I (-37, III 11[↑]), II (-37, III 13[↓]), III (+11, II 13[↓]), IV (-17, II 11[↓]).
 Measure 46: I (-23, III 1), II (+38, I 7[↑]), III (-23, II 3[↓]), IV (+38, II 1).
 Measure 47: I (+5, II 7[↑]), II (-48, IV 5[↓]), III (+5, II 13[↓]), IV (-35, II 5[↑]).
 Measure 48: I (+36, III 13[↓]), II (-21, IV 13[↑]), III (-37, III 7[↑]), IV (-26, I 7[↑]).
 Measure 49: I (+36, III 13[↓]), II (-37, IV 3[↓]), III (+5, II 13[↓]), IV (-21, III 3[↑]).

(50)

Measure 50: I (+12, III 11[↓]), II (-23, I 13[↑]), III (-6, II 11[↓]), IV (+44, II 3[↓]).
 Measure 51: I (+1, II 11[↓]), II (-48, I 13[↑]), III (-33, I 7[↓]), IV (+36, I 1).
 Measure 52: I (-46, III 3[↑]), II (-7, II 13[↑]), III (-37, II 5[↑]), IV (+17, II 13[↑]).
 Measure 53: I (-15, IV 1), II (-19, IV 3[↓]), III (+25, II 11[↓]), IV (-34, II 5[↓]).
 Measure 54: I (-17, IV 1), II (-19, IV 3[↓]), III (+1, II 11[↓]), IV (+10, I 3[↓]).
 Measure 55: I (-17, IV 1), II (-19, IV 3[↓]), III (-29, I 13[↓]), IV (+14, I 3[↑]).
 Measure 56: I (-48, II 1), II (-46, I 1), III (-7, II 13[↑]), IV (-17, II 7[↓]).

(57)

Measure 57: I (-15, IV 3[↑]), II (-15, IV 5[↑]), III (-15, II 1), IV (+37, II 11[↑]).
 Measure 58: I (+35, IV 3[↓]), II (-30, IV 5[↑]), III (-3, II 5[↓]), IV (-15, III 5[↑]).
 Measure 59: I (+28, II 7[↓]), II (-15, I 1), III (-1, II 5[↓]), IV (-50, III 11[↑]).
 Measure 60: I (+30, III 7[↓]), II (-3, III 3[↓]), III (-48, IV 3[↑]), IV (-15, III 5[↑]).
 Measure 61: I (+19, IV 7[↑]), II (+1, III 3[↑]), III (-9, IV 13[↑]), IV (-50, III 3[↑]).
 Measure 62: I (+19, IV 7[↑]), II (+19, III 1), III (-48, III 1), IV (-46, III 3[↑]).
 Measure 63: I (+21, III 7[↑]), II (-48, III 1), III (-50, III 3[↓]), IV (-17, III 7[↓]).

64

System 1 (Measures 64-69):

- Staff I:** Notes at measures 64, 65, 66, 67, 68, 69. Interval markings: IV³↑, III³↑, IV⁵↑, III⁵↑, III¹.
- Staff II:** Notes at measures 64, 65, 66, 67, 68, 69. Interval markings: III³↓, I³↑, III³↓, III⁵↓, I¹, I¹, IV³↓, III³↑.
- Staff III:** Notes at measures 64, 65, 66, 67, 68, 69. Interval markings: I³↑, I¹, IV³↓, IV⁷↓, II⁵↓, II³↑, I¹³↑, II³↑.
- Staff IV:** Notes at measures 64, 65, 66, 67, 68, 69. Interval markings: III¹, II¹, I³↑, II¹, III⁵↑, III⁷↓, II¹.

71

System 2 (Measures 70-75):

- Staff I:** Notes at measures 70, 71, 72, 73, 74, 75. Interval markings: IV⁷↓, IV⁷↑, II⁵↑, II⁷↑, IV³↑, IV¹¹↓, III³↓.
- Staff II:** Notes at measures 70, 71, 72, 73, 74, 75. Interval markings: III⁷↑, III⁷↓, III⁷↑, IV⁵↓, IV³↑, I¹³↓, III¹¹↓, I⁷↑.
- Staff III:** Notes at measures 70, 71, 72, 73, 74, 75. Interval markings: II¹, IV¹¹↓, I⁵↑, II³↓, II⁵↓, II⁷↓, IV⁷↑.
- Staff IV:** Notes at measures 70, 71, 72, 73, 74, 75. Interval markings: III³↑, I¹, III¹, II⁷↓, III¹, II⁷↑.

78

System 3 (Measures 76-81):

- Staff I:** Notes at measures 76, 77, 78, 79, 80, 81. Interval markings: IV³↓, IV¹, IV³↑, III¹, III³↑, III¹.
- Staff II:** Notes at measures 76, 77, 78, 79, 80, 81. Interval markings: IV⁵↓, IV⁵↓, I⁵↑, IV¹, IV⁷↓, I³↑.
- Staff III:** Notes at measures 76, 77, 78, 79, 80, 81. Interval markings: I¹¹↓, IV¹¹↓, II³↓, IV⁷↑, I⁷↑.
- Staff IV:** Notes at measures 76, 77, 78, 79, 80, 81. Interval markings: III¹, III³↑, III¹¹↑, III⁷↑, III¹¹↓, I¹, III⁷↓, III⁵↓, II¹¹↓, III³↓, III⁷↑.

85

+50 +1 +3 +36 -15

IV¹¹↓ IV¹ IV¹ III¹ IV¹¹↓

-48 +3 +5 -48 +5 +34

IV¹¹↑ IV¹ IV³↑ III¹¹↑ IV³↑ I⁷↓

+50 +1 -28 +5 +1 +36 +34 -17

I¹ IV¹ IV⁷↑ II¹ IV¹ IV³↑ II¹ II¹¹↓

+3 +1 +17 +34 +32 +36 -35 +36 -15

III³↑ I³↓ I⁵↓ II¹ II³↓ III¹ III⁷↓ I¹ I¹

92

-27 +2 -29 +4

III³↑ III⁷↓ IV⁵↑ IV³↑

-17 -31 -29 -29 -31 +16 -42 -29

IV³↓ IV⁵↑ III¹ IV⁵↑ III⁷↑ IV⁷↓ I⁵↑ I¹

-13 -29 -29 +0 -15 +2

IV³↑ IV⁵↑ IV⁵↑ I³↓ IV¹ II⁵↑

-17 -15 -15 -15 +2 +0

II¹ III⁵↓ III⁵↓ III¹ III¹ III³↓

98

+0 -13 +28 -5 +24 +28

IV¹ IV⁵↑ II⁵↓ II⁷↑ II³↓ IV¹

+2 -49 +14 +41 +30 +14 +26

III¹ III¹¹↓ IV⁵↓ IV¹³↑ IV³↑ I⁵↑ IV⁵↓

+0 -41 -13 +12 +14 -23 -43

IV¹ IV⁷↓ I¹³↓ IV¹ IV³↑ II¹¹↑ II⁷↓

+4 +0 +0 +28 -41 +12 +28

III³↑ I¹ III¹ I¹ III¹ II³↓ II³↑

105

-45 +40 -16 -27

II 7↑ IV 1 II 3↑

+26 -29

III 5↓

-43 -31 -27

II 3↓ II 3↑

+28 -45 -41 -2 -29 +6 +15 +24 -16 -27

I 1 III 3↑ III 13↑ III 5↓ III 11↓ I 13↓ I 7↑ II 5↓ II 3↑

115

-27 -27 -27 -16 -27 -16 +19

III 1 III 1 IV 5↓ IV 3↑ IV 5↓ IV 11↓

-29 -27 +4 -41 -29 -25 -14 -25 -41 -29 -25 -27 -41 -29 -43 -31 -14

III 1 III 5↑ III 3↑ I 3↑ IV 1 I 3↓ I 1 I 5↑ IV 1 IV 5↑ I 5↓ IV 3↓

III 7↓ III 5↑ I 5↓

-16 -27 +11 -27 -29 +21 -25 +24 -41 -29 -25 -43 +41 -39 -27 -16 +40 -29 -45 -29

IV 3↓ II 13↑ IV 1 I 3↓ I 3↑ I 5↑ I 3↑ I 3↑ IV 3↓ II 3↑ IV 5↓ IV 7↑ IV 1 II 7↑ IV 1

-27 -29 -27 +4 -41 +24 -25 -29

III 3↓ I 1 I 7↓ III 1 I 11↑ I 3↓ I 3↑

119

-16 -27 -29 -25 -14 +41 -25 +13 -25 +6 -39 -23 +15 -23 -12 -29

III 5↓ III 3↑ < III 1 II 3↑ IV 7↑ IV 13↑ III 7↓ IV 1 IV 1 III 5↓ IV 3↓

IV 5↓ IV 3↑ III 1

+2 -43 -31 -43 -25 -14 +41 -27 -23 -12 +43 +15 -27 -39 +17 -21 +34 +26 -23 +32

III 7↓ III 3↓ IV 5↑ < I 3↑ IV 7↑ III 3↑ III 7↑ III 3↓ III 5↑ IV 13↑ III 13↓ III 3↑

III 5↑ III 3↑ III 13↑ IV 3↑ III 11↑ IV 13↓

-27 -25 +13

< I 1 II 1 I 1 IV 13↑

-16 -27 +19 -31 -29 -41 -29 +21 -27 -27 -23 -12 -23 -12 +26 -27

III 5↓ III 11↓ III 1 I 5↑ III 1 I 11↓ < I 1 II 1 III 3↑ III 5↓ III 3↑ III 5↓ III 11↑

123

Staff I: -25 -14 +21 +19 -31 -27 -16 -29 -18 +38
IV 3[↑] IV 5[↓] IV 11[↓] II 11[↓] II 3[↑] IV 1 < II 1 III 5[↓] IV 7[↑]

Staff II: -29 -41 -25 -29 -16 -33 -29 -18 +38 -31 +40 +38 -31
IV 3[↓] IV 5[↑] IV 3[↑] IV 3[↓] < I 1 III 3[↓] I 1 IV 7[↑] IV 1 I 3[↑] I 1 I 7[↓]

Staff III: -41 +35 +23 -27 -29 -18 +38 -14 -31 +24 +36 +40 +36 +40
IV 5[↑] I 5[↓] I 3[↑] II 3[↑] II 1 < I 3[↓] II 3[↑] IV 3[↓] I 3[↓] I 5[↑] II 1 IV 3[↓] II 1

Staff IV: +19 -31 -29 +2 -43 -27 -16 +40 -31 +24 +38 +40
II 11[↓] III 1 III 5[↑] III 5[↓] III 7[↑] III 1 I 5[↑] I 1 III 1

127

Staff I: +38 +6 -38
III 7[↓] III 5[↑]

Staff II: +38 +36 +24 +40 +40 -25 -11 +24 -23 -45 -37 -25 +30 -40 -37 -25 +30
I 1 III 1 I 5[↑] I 3[↑] III 1 IV 1 III 3[↑] I 3[↑] I 5[↓] IV 1 I 5[↓] I 7[↑] I 3[↑]

Staff III: +36 +24 +38 +26 +6 -22 +40 -49 -25 -37 +2 -37 -40 +48 -40 -37 -25 +30 +2 -37
I 3[↓] I 5[↑] I 1 II 5[↑] I 7[↑] I 13[↑] I 5[↓] II 1 IV 5[↑] I 3[↑] I 13[↑] IV 3[↓] I 5[↑] IV 1 I 3[↑] II 1 I 7[↑] I 13[↑] I 3[↑]

Staff IV: +36 +24 -11 -11 +24 +48 -38 -40 +10 +30 -25
III 3[↓] I 11[↑] III 11[↓] I 5[↑] I 1 I 3[↓] I 11[↓] I 5[↓]

131

Staff I: -25 -37 +13 -37 +2 +30 -38 -25 +10 +13 -37 +13 -37
IV 1 II 3[↑] IV 1 II 13[↑] II 7[↑] II 11[↑] < II 1 < I 5[↓] IV 1 III 3[↑] III 3[↑]

Staff II: -38 -25 +10 -40 +48 -40 -37 -40 +48 +13 -37 -25 -37 -38
< I 1 < II 5[↓] IV 1 III 5[↑] I 3[↑] < I 3[↓] III 5[↑] IV 1 III 3[↑] III 3[↑] III 5[↓] III 1

Staff III: -25 -37 +2 +30 -38 -10 +28 +30 -38 +8 -42 -38 -35 +21 -38
IV 1 IV 1 II 13[↑] II 1 I 13[↓] I 3[↓] < I 1 I 1 IV 11[↓] I 1 II 3[↑] I 13[↓] < I 1

Staff IV: -25 -37 -25 +30 +44 -40 -37 -25 -5 +13 -37 -40 -38
II 3[↑] II 5[↓] I 5[↓] < II 3[↓] I 3[↑] III 5[↓] II 7[↓] < I 11[↑] I 1 III 3[↓] III 1

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Staff I: -38, -40, +48, +13, -37. Chords: $<III^1$, $<I^{3\downarrow}$, $IV^{5\uparrow}$, $IV^{11\uparrow}$, $IV^{3\uparrow}$.

Staff II: -37, +13, -7, +48, -40, -37, -25, +30, -38, -7, -40, +48, -38. Chords: $<I^1$, $IV^{11\uparrow}$, III^1 , $I^{5\uparrow}$, $I^{3\downarrow}$, $I^{3\uparrow}$, $I^{5\downarrow}$, $<I^{7\uparrow}$, IV^1 , $IV^{7\downarrow}$, I^1 , $IV^{5\uparrow}$, IV^1 .

Staff III: -7, +48, -40, -21, -25, -40, -37, -25, +30, +46, -40, +48, +13, -37. Chords: $IV^{7\downarrow}$, $I^{5\uparrow}$, II^1 , $IV^{5\uparrow}$, $I^{5\downarrow}$, $I^{3\downarrow}$, $I^{3\uparrow}$, $<II^1$, $IV^{7\uparrow}$, $I^{5\uparrow}$, I^1 , $IV^{5\uparrow}$, $IV^{11\uparrow}$, $IV^{3\uparrow}$.

Staff IV: -38, -7, -38, -27, -38, -38. Chords: III^1 , I^1 , $II^{3\downarrow}$, I^1 , $<I^1$.

136

Staff I: -38, -38. Chords: $<IV^1$.

Staff II: -38, -37, -25, -40, -37, -38, -25, -40, +48, +13, -37, -25, +30. Chords: $<II^1$, IV^1 , $I^{5\downarrow}$, III^1 , III^1 , I^1 , IV^1 , $I^{3\downarrow}$, $I^{5\uparrow}$, $I^{11\uparrow}$, IV^1 , $I^{5\downarrow}$, $I^{7\uparrow}$.

Staff III: -40, -37, -25, -38, -7, -11, -40, -37, -25, -38, -35, +48, -40, +21. Chords: $<IV^{3\downarrow}$, IV^1 , IV^1 , II^1 , $I^{7\downarrow}$, $II^{5\downarrow}$, $I^{3\downarrow}$, $I^{3\uparrow}$, $I^{5\downarrow}$, I^1 , $IV^{3\uparrow}$, $I^{5\uparrow}$, $I^{3\downarrow}$, $I^{13\downarrow}$.

Staff IV: -37, -25, -37, +2, -40, -37, -25, -1, -38. Chords: $<III^1$, $I^{5\downarrow}$, $I^{3\uparrow}$, $I^{13\uparrow}$, $I^{3\uparrow}$, $I^{3\uparrow}$, $I^{5\downarrow}$, $II^{7\uparrow}$, I^1 .

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Staff I: -38, +28, -40, +46, +11, -38, +0, +28, -40. Chords: $III^{7\uparrow}$, IV^1 , $5\uparrow$, $11\uparrow$, 1 , $13\uparrow$, $7\uparrow$, 1 .

Staff II: +30, -38, +11, -42, +46, -9, -27, -38, -42, +46, +11, -38, +28, +0, -38, +11, +46, -37, -40. Chords: $III^{3\uparrow}$, $IV^{3\downarrow}$, $IV^{5\uparrow}$, $IV^{7\downarrow}$, $I^{5\downarrow}$, $IV^{3\uparrow}$, $I^{5\uparrow}$, $I^{11\uparrow}$, $I^{3\downarrow}$, $I^{3\uparrow}$, $7\uparrow$, $13\uparrow$, $3\uparrow$, $11\uparrow$, $5\uparrow$, $3\uparrow$, IV^1 .

Staff III: +13, -37, +10, -40, -9, +46, -42, +19, -40, -9, +46, -42, +46, -38. Chords: $I^{11\uparrow}$, $IV^{11\downarrow}$, $IV^{3\uparrow}$, $IV^{3\downarrow}$, $I^{7\downarrow}$, $I^{5\uparrow}$, $I^{3\downarrow}$, $I^{13\downarrow}$, III^1 , $I^{7\downarrow}$, $I^{5\uparrow}$, IV^1 , $I^{5\uparrow}$.

Staff IV: -38, -40, +28, -40, -42, -38, -42, -38, -38, -40. Chords: III^1 , $I^{7\uparrow}$, III^1 , $I^{3\downarrow}$, $3\uparrow$, $3\downarrow$, $3\uparrow$, $3\uparrow$, 1 .