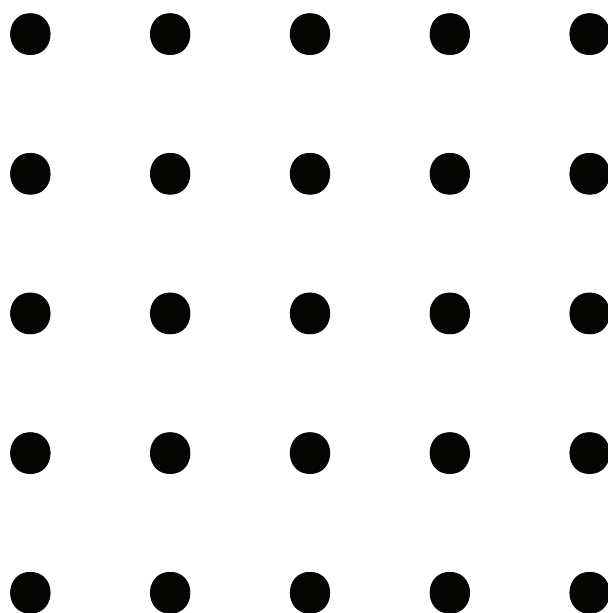


DRONE GARDEN

FOR 25 STRING MUSICIANS, A MOBILE AUDIENCE,
AND A VERY LARGE ROOM



GENERAL PERFORMANCE NOTES

NOTE: This score is adapted for my 2020 Princeton application to cover only the third movement, and the legend and performance notes are shortened to reflect this. The score was used to record the individual parts that are featured in the computer program and VR experience.

Drone Garden is an immersive piece for 25 string musicians spread out in a large simulated room created with Unreal Engine. While it was written for a pre-recorded virtual-reality experience, it can also be performed live with click tracks fed to the performers through headphones. Through simulated audio spatialization, a listener's relative proximity to each audio source determines how the aggregate of the parts is perceived, creating a unique experience on every listen.

Consisting three movements that cycle indefinitely, *Drone Garden* is an exploratory proof-of-concept piece that examines the creative possibilities of the specialized virtual environment. In the third movement, the time signature and click track are meant only as a time reference. Players should vary their parts expressively as individuals, rather than aiming for tight coordination, even with the parts that are doubled. The movement is intended to be a landscape of complementary individual expressions rather than an ensemble acting as a single instrument.

Notes for players:

- No vibrato unless specified.
- For all instruments other than cello and contrabass, tremolo notes are not played in time, and are to be approximately divided according to the number of lines.
- Glissandos should span the entire note preceding the line. Long notes are divided with a tie to indicate this length.
- All performers follow a pre-recorded click track that begins at 120 bpm. From bars 82 to 146, it increases to 152 bpm, where it remains until the end of the movement.

Drone Garden was also intended as a framework for future compositions and a new means of distributing music. Other composers are encouraged to download the Unreal file to place their own compositions into the virtual performance space.

This project was developed with generous support from the PHI Centre and the Canada Council for the Arts.

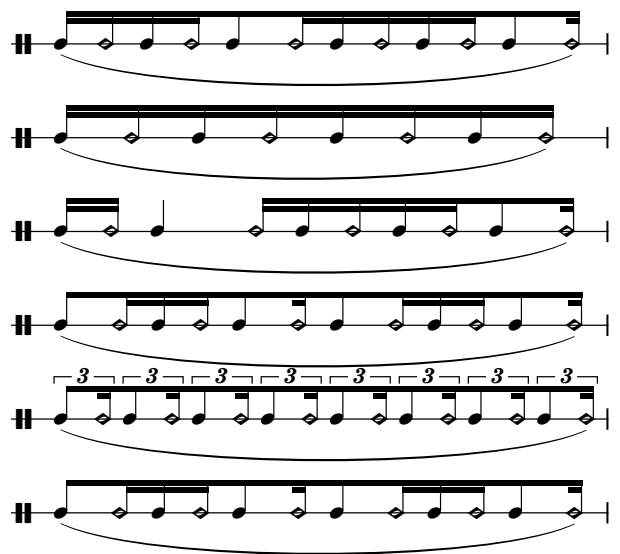
NOTES FOR CELLOS

Suggested patterns for long notes

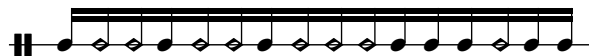
Long cello notes should be played by quickly alternating between a note and its harmonic by simply lifting the left-hand finger slightly. These are suggested rhythmic patterns, based loosely on super-imposed Euclidean note divisions. Performers should become familiar with these rhythms until they are intuitive, and should randomly shuffle through the set of patterns by fluently repeating, truncating, and modifying them as they wish, with bias toward the first pattern listed.

Any transitional harmonics or overtones are encouraged. To achieve this, a performer may want to either lift their left-hand finger more than a harmonic normally requires, or vary their bow position relative to the bridge.

Performers should tune a note to its harmonic, not to the other performers. The time signature and click track are meant only as a time reference. Players should vary their parts expressively as individuals, rather than aiming for tight coordination between all players, even with the parts that are doubled.



Example division of “tremolo” notes



When cello notes are marked as tremolo, the player should alternate quickly and semi-randomly between the note and its harmonic. Doubling or tripling notes is encouraged, as shown in the example rhythm above. Cello notes marked as tremolo should always be divided into 16th notes.

PLAYER POSITIONS

Players should be arranged in the following grid, with approximately 3 meters between each musician:

Cello 4	Viola 1	Violin 1	Viola 2	Cello 2
Violin 3	Cello 3	Viola 8	Cello 3	Violin 5
Viola 5	Violin 8	Cello 3/ Contrabass	Violin 7	Viola 6
Violin 6	Cello 5	Viola 7	Cello 1	Violin 4
Cello 2	Viola 3	Violin 2	Viola 4	Cello 4

LEGEND



Fade to/from silence



Instant attack/decay: instantly go from silence to desired volume, or vice/versa, similar to the attack of an organ note

I - IV

String indicator

Artificial Harmonics



Half-pressed note

Root note

Atonal Slides



Bridge

Relative finger position over time

Midpoint of fingerboard

♩ = 120

only on D string for entire movement

Violoncello 1
4D
mp

Violoncello 2
1E, 4A
mp

Violoncello 3
or Contrabass
3C, 2B, 2D
mp

Violoncello 4
1A

Violoncello 5
4B

Violin 1
1C

Violin 2
5C

Violin 3
2A

Violin 4
4E

Violin 5
2E

Violin 6
4A

Violin 7
3D

Violin 8
2C

Viola 1
1B

Viola 2
1D

Viola 3
5B

Viola 4
5D

Viola 5
3A

Viola 6
3E

Viola 7
4C

Viola 8
2C

12

Vc. 1

Vc. 2

Vc. 3

Vc. 4

Vc. 5

Vln 1

Vln 2

Vln 3

Vln 4

Vln 5

Vln 6

Vln 7

Vln 8

Vla 1

Vla 2

Vla 3

Vla 4

Vla 5

Vla 6

Vla 7

Vla 8

mp

only on D string for entire movement

The image shows a page of a musical score for strings, measures 12 through 21. The score is arranged in a system with 18 staves. The top four staves are for Violoncellos (Vc. 1-4), the next four for Violins (Vln 1-4), the next four for Violins (Vln 5-8), and the bottom six for Violas (Vla 1-8). The key signature is one sharp (F#) and the time signature is 4/4. The first measure is marked with a rehearsal mark '12'. The Violoncello parts (Vc. 1-4) play a melodic line consisting of eighth notes with a slur over the first four measures and a fermata over the last four. The dynamic is marked *mp*. A note in the first measure of Vc. 4 is specifically marked 'only on D string for entire movement'. The Violin parts (Vln 1-8) and Viola parts (Vla 1-8) are silent, indicated by a flat line with a bar line. A dynamic hairpin is present in the Viola parts, starting in measure 12 and ending in measure 21, with a crescendo in measures 12-15 and a decrescendo in measures 16-21.

24

Vc. 1

Vc. 2

Vc. 3

Vc. 4

Vc. 5

Vln 1

Vln 2

Vln 3

Vln 4

Vln 5

Vln 6

Vln 7

Vln 8

Vla 1

Vla 2

Vla 3

Vla 4

Vla 5

Vla 6

Vla 7

Vla 8

only on A string for entire movement

mp

37

Vc. 1

Vc. 2

Vc. 3

Vc. 4

Vc. 5

Vln 1

Vln 2

Vln 3

Vln 4

Vln 5

Vln 6

Vln 7

Vln 8

Vla 1

Vla 2

Vla 3

Vla 4

Vla 5

Vla 6

Vla 7

Vla 8

mf

mf

Detailed description: This page of a musical score, labeled '8' and 'III', contains measures 37 through 46. It features a large ensemble of instruments: five violas (Vc. 1-5) and eight violins (Vln 1-8). The violas are in the upper staves, and the violins are in the lower staves. The key signature is one sharp (F#), and the time signature is 4/4. The score begins at measure 37, indicated by a bracket and the number '37'. The violas have active parts with various note values and slurs. The violins are mostly silent, indicated by rests. Dynamic markings include 'mf' (mezzo-forte) in measures 38 and 42. The page ends at measure 46.

50

Vc. 1
Vc. 2
Vc. 3
Vc. 4
Vc. 5
Vln 1
Vln 2
Vln 3
Vln 4
Vln 5
Vln 6
Vln 7
Vln 8
Vla 1
Vla 2
Vla 3
Vla 4
Vla 5
Vla 6
Vla 7
Vla 8

Detailed description: This page of a musical score, labeled 'III' and '9', contains measures 50 through 59. The score is for a string ensemble and includes five violas. The top five staves are for violas (Vc. 1-5) and the bottom thirteen staves are for violins (Vln 1-8) and violas (Vla 1-8). The key signature is one sharp (F#) and the time signature is 4/4. Measures 50-59 show a complex texture with various melodic lines and sustained notes. The violas (Vc. 1-5) play a prominent role in the upper register, while the violins (Vln 1-8) and lower violas (Vla 1-8) provide harmonic support with sustained notes and occasional melodic fragments. The score is written in a standard musical notation style with a clean, professional layout.

63

Vc. 1
Vc. 2
Vc. 3
Vc. 4
Vc. 5
Vln 1
Vln 2
Vln 3
Vln 4
Vln 5
Vln 6
Vln 7
Vln 8
Vla 1
Vla 2
Vla 3
Vla 4
Vla 5
Vla 6
Vla 7
Vla 8

Detailed description: This page of a musical score, numbered 10 and marked 'III', contains measures 63 through 72. The score is for a string ensemble consisting of five violins (Vln 1-5) and eight violas (Vla 1-8). The key signature is one sharp (F#) and the time signature is 4/4. Measures 63-65 feature the first five violins with melodic lines, while measures 66-72 feature the remaining three violins and all eight violas with sustained notes. The notation includes various musical symbols such as stems, beams, and slurs.

74 tempo begins to increase

Violin 1-8 and Viola 1-8 parts are shown. The score includes dynamic markings (*p*) and fingering indications (I, II, III, IV). The tempo instruction "tempo begins to increase" is located at the top right of the page.

85

The image shows a page of a musical score, page 12, section III, starting at measure 85. The score is for a string ensemble consisting of five Violin parts (Vln 1-5) and eight Viola parts (Vla 1-8). The key signature is one sharp (F#) and the time signature is 4/4. The Violin parts have melodic lines with various dynamics: Vln 1 starts with *ff* and *mp*; Vln 4 starts with *f* and *mf*; Vln 5 has *f* and *mp* markings. The Viola parts are mostly silent, indicated by rests. The score is written on a grand staff with five staves for violins and eight staves for violas.

95

This musical score page, numbered 95, contains measures 95 through 100. It features a variety of instruments: Violins 1-8, Violas 1-8, and Violas 1-8. The key signature is one sharp (F#), and the time signature is 4/4. The score is characterized by dynamic markings such as *ff*, *mp*, *f*, and *mf*. The Violin parts (Vln 1-8) play a melodic line with slurs and accents, while the Viola parts (Vla 1-8) provide a harmonic accompaniment with slurs and accents. The Violoncello parts (Vc. 1-5) play a rhythmic accompaniment with slurs and accents. The score is written in a standard musical notation style with a clean, professional layout.

106

Vc. 1
 Vc. 2
 Vc. 3
 Vc. 4
 Vc. 5
 Vln 1
 Vln 2
 Vln 3
 Vln 4
 Vln 5
 Vln 6
 Vln 7
 Vln 8
 Vla 1
 Vla 2
 Vla 3
 Vla 4
 Vla 5
 Vla 6
 Vla 7
 Vla 8

mf
mp
f
mp
mf
f
ff
mp
mp
mp
mp
mp
mf
mf
mp
mp
mp
mp
mp
mp
mp
mp
mp
mp

harmonic slide
 start on bottom note, flutter in waves
tr
mf
mf
mf
 harmonic slide

117

Vc. 1

Vc. 2

Vc. 3

Vc. 4

Vc. 5

Vln 1

Vln 2

Vln 3

Vln 4

Vln 5

Vln 6

Vln 7

Vln 8

Vla 1

Vla 2

Vla 3

Vla 4

Vla 5

Vla 6

Vla 7

Vla 8

mf

ff

Detailed description: This page of a musical score, labeled 'III' and '15', covers measures 117 to 121. It features a large ensemble of instruments: five violas (Vc. 1-5) and eight violins (Vln 1-8). The key signature is one sharp (F#) and the time signature is common time (C). The violas have active parts with long, sweeping phrases. Vc. 1 and Vc. 2 play sustained notes with long slurs. Vc. 3 has a dynamic marking of *ff* (fortissimo) in measure 120. Vc. 4 and Vc. 5 have dynamic markings of *mf* (mezzo-forte). The violin parts (Vln 1-8) are mostly silent, indicated by horizontal lines with stems. The viola parts (Vla 1-8) also have stems but no notes. The score is written on a grand staff with five systems of staves.

122

The musical score is for a string orchestra, spanning measures 122 to 127. It features parts for Violins (Vln) 1 through 8, Violas (Vla) 1 through 8, and a double bass part (Vc. 1). The key signature is one sharp (F#). The score includes various musical notations such as notes, rests, slurs, and dynamic markings. Dynamics are marked as *mp* (mezzo-piano), *mf* (mezzo-forte), and *ff* (fortissimo). The string parts consist of sustained notes with some movement in the upper strings. The double bass part has some rests and a final note in measure 127.

Violins 1-8: *mp*

Violas 1-8: *mp*

Violoncello 1: *ff*, *mp*, *ff*, *mf*, *ff*

129

The musical score is for measures 129 through 136. It features five parts for Violins (Vc. 1-5) and eight parts for Violas (Vln 1-8 and Vla 1-8). The key signature is one sharp (F#). The score includes dynamic markings: *ff* (fortissimo) and *mp* (mezzo-piano). The Violin parts have various articulations and slurs. The Viola parts are mostly rests with some notes in the lower register. The Violin 1 part starts with a *mp* dynamic and has a *ff* dynamic in measure 131. The Violin 2 part has a *ff* dynamic in measure 131. The Violin 3 part has a *ff* dynamic in measure 131. The Violin 4 part has a *mp* dynamic in measure 131. The Violin 5 part has a *mp* dynamic in measure 131 and a *ff* dynamic in measure 134. The Viola parts are mostly rests.

138 ♩ = 152

This page contains a musical score for measures 138 to 152. The score is divided into two systems. The first system includes Violins 1-8 and Violas 1-8. The second system includes Violins 1-5 and Violas 1-8. The key signature is one sharp (F#) and the time signature is 4/4. The score features various dynamics such as *mf*, *ff*, *mp*, and *f*. There are also performance markings like *ff* at the end of measure 152. The notation includes stems, beams, and slurs for the string parts, and stems with flags for the woodwind parts.

Vc. 1 *ff*

Vc. 2 *mf* *ff* *mp*

Vc. 3 *mf*

Vc. 4 *ff* *mp* *ff*

Vc. 5 *mf* *f* *mp*

Vln 1 *mp*

Vln 2 *mp*

Vln 3 *mp*

Vln 4 *mp*

Vln 5 *mp*

Vln 6 *mp*

Vln 7 *mp*

Vln 8 *mp*

Vla 1 *mp*

Vla 2 *mp*

Vla 3 *mp*

Vla 4 *mp*

Vla 5 *mp*

Vla 6 *mp*

Vla 7 *mp*

Vla 8 *mp*

147

This musical score page, numbered 147, contains measures 147 through 156. It features five Violoncello (Vc.) parts and eight Viola (Vla.) parts. The Vc. parts are active, with Vc. 1 and Vc. 2 playing a melodic line with dynamic markings of *ff* and *mf*. Vc. 3, 4, and 5 provide harmonic support with various dynamics including *f*, *mf*, and *ff*. The string sections (Vln 1-8 and Vla 1-8) are mostly silent, indicated by rests on their staves. The score is written in a key signature of one sharp (F#) and a common time signature (C).

159

Violins 1-5: Violin 1 starts with *mp*, Violin 2 with *ff*, Violin 3 with *mp*, Violin 4 with *mp*, and Violin 5 with *ff*. Violin 1 includes a *sul pont.* instruction starting at measure 164.

Violins 6-8: Violin 6 includes a *sul pont.* instruction starting at measure 164. Violin 7 and 8 include the instruction "alternate between the two notes randomly on strings I and II".

Violas 1-5: Viola 1 includes a *sul pont.* instruction starting at measure 164. Viola 5 includes the instruction "alternate between the two notes randomly on strings II and III".

Violas 6-8: Viola 6 includes the instruction "alternate between the two notes randomly on strings II and III".

Violas 1-5: Viola 1 includes a *sul pont.* instruction starting at measure 164. Viola 5 includes the instruction "alternate between the two notes randomly on strings II and III".

Violas 6-8: Viola 6 includes the instruction "alternate between the two notes randomly on strings II and III".

Violins 6-8: Violin 6 includes a *sul pont.* instruction starting at measure 164. Violin 7 and 8 include the instruction "alternate between the two notes randomly on strings I and II".

Violas 1-5: Viola 1 includes a *sul pont.* instruction starting at measure 164. Viola 5 includes the instruction "alternate between the two notes randomly on strings II and III".

Violas 6-8: Viola 6 includes the instruction "alternate between the two notes randomly on strings II and III".

Violins 1-5: Violin 1 starts with *mp*, Violin 2 with *ff*, Violin 3 with *mp*, Violin 4 with *mp*, and Violin 5 with *ff*. Violin 1 includes a *sul pont.* instruction starting at measure 164.

Violins 6-8: Violin 6 includes a *sul pont.* instruction starting at measure 164. Violin 7 and 8 include the instruction "alternate between the two notes randomly on strings I and II".

Violas 1-5: Viola 1 includes a *sul pont.* instruction starting at measure 164. Viola 5 includes the instruction "alternate between the two notes randomly on strings II and III".

Violas 6-8: Viola 6 includes the instruction "alternate between the two notes randomly on strings II and III".

170

Vc. 1

Vc. 2

Vc. 3

Vc. 4

Vc. 5

Vln 1

Vln 2

Vln 3

Vln 4

Vln 5

Vln 6

Vln 7

Vln 8

Vla 1

Vla 2

Vla 3

Vla 4

Vla 5

Vla 6

Vla 7

Vla 8

mp *f* *mf* *mf*

sliding harmonics with fast tremolo *mf*

p *ff*

sliding harmonics

p *ff*

sliding harmonics with medium tremolo

p *ff*

tr

gradually speed up trill

p *ff*

8va sliding tremolo (approximate pitches)

p *ff*

tr

p *ff*

sliding harmonics with fast tremolo

p *ff*

tr

p *ff*

sliding harmonics with fast tremolo

p *ff*

sliding harmonics

p *ff*

sliding harmonics with medium tremolo

p *ff*

tr

gradually speed up trill

p *ff*

8va sliding tremolo (approximate pitches)

p *ff*

tr

p *ff*

sliding harmonics

p *ff*

tr

gradually speed up trill

p *ff*

180

Vc. 1

Vc. 2

Vc. 3

Vc. 4

Vc. 5

Vln 1

Vln 2

Vln 3

Vln 4

Vln 5

Vln 6

Vln 7

Vln 8

Vla 1

Vla 2

Vla 3

Vla 4

Vla 5

Vla 6

Vla 7

Vla 8

f

ff

ff

f

ff

ff

Detailed description: This page of a musical score, numbered 22, is titled 'III' and contains measures 180 through 183. The score is for a string and woodwind ensemble. The top five staves are for violins (Vc. 1-5) and the bottom eight are for violas (Vln 1-8 and Vla 1-8). The key signature is one sharp (F#) and the time signature is common time (C). The first measure (180) features a dynamic marking of *f* (forte) for Vc. 3 and Vc. 4, and *ff* (fortissimo) for Vc. 5. The second measure (181) has *f* for Vc. 3 and Vc. 4, and *ff* for Vc. 5. The third measure (182) has *ff* for Vc. 3 and Vc. 4, and *ff* for Vc. 5. The fourth measure (183) has *f* for Vc. 4 and Vc. 5, and *ff* for Vc. 3. The woodwind parts (Vln 1-8 and Vla 1-8) are mostly silent, indicated by rests. The string parts (Vc. 1-5) play sustained notes, with some dynamics and articulation marks. A large bracket spans across the top of the first five staves, indicating a section or phrase. The page number '180' is written at the top left of the first staff.

This musical score page contains 23 staves, divided into three sections: Violins (Vc. 1-5), Violins (Vln 1-8), and Violas (Vla 1-8). The score is in G major and 4/4 time. It features a variety of musical textures, including sustained notes, trills, and tremolos. Performance instructions are provided for several staves, such as 'intensify with bow pressure and frequent bow changes' and 'gradually speed up trill'. Dynamic markings like *mf*, *ff*, *pp*, and *mp* are used throughout. A section marker 'III' is placed at the top, and the page number '23' is in the top right corner.

Violin Section (Vc. 1-5): Violins 1 and 2 play sustained notes with dynamic markings *mf*, *ff*, and *pp*. Violins 3, 4, and 5 play similar sustained notes with *pp* dynamics.

Violin Section (Vln 1-8): Violins 1-3 play sustained notes with *mf* dynamics. Violins 4-8 play trills and tremolos, with instructions to 'gradually speed up trill' and 'intensify with bow pressure and frequent bow changes'.

Viola Section (Vla 1-8): Violas 1-3 play sustained notes with *mf* dynamics. Violas 4-8 play trills and tremolos, with instructions to 'gradually speed up trill' and 'intensify with bow pressure and frequent bow changes'.

194

Violin 1: sliding harmonics with tremolo, *f*

Violin 2: quickly sliding harmonics, no tremolo, *f*

Violin 3: sliding notes with tremolo, *f*

Violin 4: (in free rhythm, similar to what is written), *mf*, triplets

Violin 5: all the way up

Violin 6: *f*

Violin 7: (in free rhythm, similar to what is written), *mf*, triplets

Violin 8: sliding harmonics with tremolo, *f*

Viola 1: sliding harmonics with tremolo, *f*

Viola 2: quickly sliding harmonics, no tremolo, *f*

Viola 3: sliding notes with tremolo, *f*

Viola 4: (in free rhythm, similar to what is written), *mf*, triplets, all the way up

Viola 5: *f*

Viola 6: *f*

Viola 7: quickly sliding harmonics, no tremolo

Viola 8: *f*

204

Vc. 1
Vc. 2
Vc. 3
Vc. 4
Vc. 5
Vln 1
Vln 2
Vln 3
Vln 4
Vln 5
Vln 6
Vln 7
Vln 8
Vla 1
Vla 2
Vla 3
Vla 4
Vla 5
Vla 6
Vla 7
Vla 8

Detailed description: This page of a musical score, numbered 204, features a system of 13 staves. The top five staves are for violas (Vc. 1-5) and the bottom eight are for violins (Vln 1-8) and violas (Vla 1-8). The key signature is one sharp (F#) and the time signature is 4/4. The violas (Vc. 1-5) play a melodic line of six quarter notes, each with a slur above it. The violins (Vln 1-8) and the lower violas (Vla 1-8) play a rhythmic accompaniment of quarter notes, with the first note of each measure being an eighth rest followed by a quarter note. The score is enclosed in a large rectangular frame.