RICE UNIVERSITY

Theme and Variations
for String Quartet

by

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A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE

Doctor of Musical Arts

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HOUSTON, TEXAS
APRIL 2009
UMI Number: 3362402

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ABSTRACT

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This piece contains a theme and nine variations exploring a chromatic harmonic pattern. The variations range from gentle and whimsical to stark and serious to wild and virtuosic, all within a world of romantic, futuristic idealism inspired by the music of Olivier Messiaen, Ben Johnston, Kelley Polar, and Morgan Geist. An important concern in the composition of this piece was flexibility in its tuning possibilities – the quartet may be performed in either twelve-tone equal temperament or strict five-limit just intonation, or an intuitive compromise between the two.
The *Theme and Variations* was commissioned by Apple Hill Center for Chamber Music and its Director, Leonard Matczynski, and is dedicated to the Apple Hill Chamber Players.

With warmest thanks to Karim Al-Zand, Marjorie Gere, Jacob Barton, Lembit Beecher, and W.A. Mathieu
PERFORMANCE NOTES

• Duration: ~15-16 minutes

• Pauses between variations are indicated by fermatas over double barlines, and should be rather short (about the length of a measure or two): keep the momentum flowing, but allow enough time to change gears. The only exception is the end of Variation 7, which runs without pause directly into Variation 8.

* * *

The following notes are all related to tuning. This should not be taken to suggest that intonation is the most important consideration in performance of the Theme and Variations – intonation is no more or less important here than in any other string quartet; it is simply the one musical parameter in the Theme and Variations whose notation requires additional explanation. While this information precedes the score, much of it is related to fine detail and need not necessarily be considered in the initial stages of practice and rehearsal.

Intonation is a complex issue with respect to the performance of any piece of the string quartet repertoire, and the subtle details of how sharp or flat a pitch should be played in various contexts are conventionally left to performers’ intuitions. In contrast, the following notes describe precisely how one might tune each pitch of the Theme and Variations.

By clarifying my intentions in this way, I hope to help performers of the Theme and Variations to be as intonationally precise as they would like to be. There is still room for flexibility; in fact, the Theme and Variations is intended to be harmonically sensible in either equal temperament or just intonation. Realistically, string quartet repertoire is not performed in strict equal temperament or strict just intonation, but rather an intuitive compromise between the two; this approach is also a sensible one for the Theme and Variations.

It is my hope that the information included below, combined with slow practice with a drone, will facilitate a combination of intuitive and intellectual approaches to intonation, and will illuminate the relationships between the familiar and surprising harmonies of the Theme and Variations.

Throughout the following discussion, the terms “pure fifth” and “pure major third” refer to the perfect fifth and major third derived from the overtone series (for those familiar with just intonation ratios, the ratios 3:2 and 5:4, respectively). These are pure, beatless, resonant consonances.
I. Drone Options

I strongly recommend tuning and practicing with a drone as a method for internalizing the tuning of the Theme and Variations.

Two good options for a sustained practice drone are 1) an electronic instrument or 2) a “drone tape” – a recording of continuous drone. In either case, it will be most ideal to work with a drone tuned to a pure C - G fifth, though if this is not possible, an equal-tempered fifth, or a C alone, can be used instead. A CD-length recording of a continuous C - G tamboura drone can be purchased from the following website:

http://www.marinsufis.com/music_media.php

II. Tuning Instructions

The following instructions describe how to tune the pitches of the Theme and Variations to a C - G drone. They begin with instructions for tuning open strings, and then discuss the tuning of all twelve pitch classes used in the quartet.

These instructions are succinct and dense; for a more thorough introduction to these pitches, I recommend pp. 12-67 of W.A. Mathieu’s Harmonic Experience. This beautifully written and very practical text appeals to both the intellect and intuition, and is responsible for clarifying my own understanding of just intonation, equal temperament, and harmony in general.

IIA. Overview: Tuning Lattice

The lattice below gives a graphic representation of the tuning of all twelve pitch classes of the Theme and Variations. Horizontal lines indicate pure fifth relations, and vertical lines indicate pure major third relations. C and G, the tonic and dominant, stand at the center of the lattice; they are the references by which all other pitches are tuned.

\[
\begin{array}{c|c|c|c|c}
A & E & B & F^\# \\
\hline
\mid & & & \\
F & C & G & D \\
\hline
\mid & & & \\
D_b & A_b & E_b & B_b \\
\end{array}
\]

1 An equal-tempered fifth is only about two cents flat from a pure fifth; this difference is almost imperceptible.

2 W.A. Mathieu, Harmonic Experience (Rochester, VT: Inner Traditions, 1997).
Moving to the right along the horizontal lines, the pitches ascend by pure fifths (D is a pure fifth above G). Moving to the left along the horizontal lines, the pitches descend by pure fifths (F is a pure fifth below C). Octave equivalence is assumed: whether the F is in a higher or lower register than the C, its harmonic relation to C is considered to be the pure fifth below.

Similarly, moving upwards along the vertical lines, the pitches ascend by pure major thirds (E is a pure major third above C). Moving downwards along the vertical lines, the pitches descend by pure major thirds (A♭ is a pure major third below C). Again, octave equivalence is assumed: whether the A♭ is in a higher or lower register than the C, its harmonic relation to C is considered to be the pure major third below.

IIB. Open string tuning instructions for individual practice with C – G drone

The following instructions present a method for tuning open strings according to the above lattice, with a C – G drone as reference. This method is suggested for individual practice.

Violins:
1. Tune G string to drone G.
2. Tune D string a pure fifth above G.
3. Tune E string a pure major third above drone C.
4. Tune A string to a pure fifth below the E string. The resulting interval between the open D and A strings will not be a pure fifth\(^3\); it will be a dissonant interval about 22 cents smaller than a pure fifth. This interval does not appear in the Theme and Variations.

Viola and Cello:
1. Tune C and G strings to drone C and G.
2. Tune D string a pure fifth above G.
3. Listen for the overtone E in the drone (it will be present as the fifth partial of the drone C, two octaves and a pure major third above the C.) Tune A string a pure fifth below this E. As with the violins' tuning, the resulting interval between the open D and A strings will not be a pure fifth\(^3\); it will be about 22 cents small. Again, this interval does not appear in the Theme and Variations.

\(^3\) Note that D and A are not connected by a horizontal line in the lattice.
IIC. Open string tuning instructions for group rehearsal and performance

The following instructions present a method for achieving exactly the same tuning as the one given above; however, this method emphasizes the tuning of the four instruments with each other, and need not refer to a drone. This method is suggested for group rehearsal and performance.

1. Start by tuning all G strings to a reference G.
2. Tune all C and D strings to pure fifths below and above this G.
3. Play the fifth partial of the cello or viola C string (touch the harmonic node a pure major third above the open string), and tune violin E strings to match this E.
4. Tune all A strings a pure fifth below violin E strings.

IID. Instructions for tuning all pitches with C - G drone

The following instructions divide the twelve pitch classes of the Theme and Variations into three groups, corresponding to the middle, top, and bottom rows of the lattice. (I have reproduced the lattice here for convenience).

\[
\begin{align*}
&|A| & |E| & |B| & |F_b| \\
&| & | & | & | \\
&|F| & |C| & |G| & |D| \\
&| & | & | & | \\
&|D_b| & |A_b| & |B_b| & |
\end{align*}
\]

1. The central row of fifths: F, C, G, D

- Tune C and G to drone C and G.
- Tune D a pure fifth above the G drone.
- Tune F a pure fifth below the C drone. (If playing the F in a higher register than the drone, it may be helpful to focus the ear on a higher octave overtone of the C drone, and tune F a fifth below that.)

These pitches are the only ones tuned exclusively by fifths with the drone. Since equal-tempered fifths are very close to pure fifths, these pitches are nearly identical to those of equal temperament.

2. Pitches tuned a pure major third above the central row of fifths: A, E, B, F\#

- Tune each of these four pitches a pure major third above the corresponding pitch in the central row of fifths: tune A a pure major third above F; tune E a pure
major third above C; tune B a pure major third above G, and tune F♯ a pure major third above D.

Since a pure major third is 14 cents smaller than an equal-tempered major third, these four pitches are all slightly lower than those of equal temperament. Additionally, it is important to notice that these four pitches make a row of fifths as well; thus A can also be thought of as a pure fifth below E, and F♯ can also be thought of as a pure fifth above B, etc.

3. Pitches tuned a pure major third below the central row of fifths: D♯, A♯, E♯, B♯

- Tune each of these four pitches a pure major third below the corresponding pitch in the central row of fifths: tune D♯ a pure major third below F; tune A♯ a pure major third below C; tune E♯ a pure major third below G, and tune B♯ a pure major third below D.

Since a pure major third is 14 cents smaller than an equal-tempered major third, these four pitches are all slightly higher than those of equal temperament. Again, it is important to notice that these four pitches also make a row of fifths; thus D♯ can also be thought of as a pure fifth below A♯, and B♯ can also be thought of as a pure fifth above E♯, etc.

III A. Tuning Major and Minor Triads

A simple practice for building familiarity with these pitches in context is to tune the six pure major triads and six pure minor triads available within the lattice. These twelve triads are presented below in four groups of tonic, subdominant, and dominant triads.

- C major, F major, G major
- C minor, F minor, G minor
- E minor, A minor, B minor
- A♭ major, D♭ major, E♭ major

Practice first with the drone and then without. When practicing with the drone, it will be easiest to tune the pitches with the simplest relation to the drone first, and then tune other pitches to them – for example, when tuning a D♭ major triad, it will be easiest to first tune the F and A♭ to the drone C, and then tune the D♭ to the A♭.

4 Note that the third of these pure minor triads will be a pure major third below the fifth of the triad – this means that the most effective way to tune the third will be to tune down a major third from the fifth, not up a minor third from the root.
IIIB. Tuning Dissonant Sonorities

In addition to these consonant sonorities, the Theme and Variations also makes use of dissonant intervals (augmented seconds, diminished fourths, and diminished thirds), which are more difficult to tune. Still, the tuning of these intervals can be practiced in the same way: first with, and then without the drone.

For example, at measure 5 of the theme, the cello, viola, and second violin play B, E, and A♭ together. The diminished fourth between E and A♭, if tuned according to the lattice above, is a strongly dissonant interval, about 41 cents larger (almost a quarter tone) than a pure major third.

In order to practice this interval, do not tune the A♭ directly to the E, but rather, tune both the A♭ and the E to the drone: tune the A♭ a pure major third below C, and tune the E a pure major third above C. The dissonance between the A♭ and E is a result of both pitches tuning resolutely to the tonic C (or the memory of the tonic C, if the drone is removed), rather than to each other.

The following lists include all similarly dissonant intervals included in the Theme and Variations. In each case, the clearly dissonant spelling serves as a helpful and intuitive indication of the dissonance of the interval. All of these can be practiced in the same way (tune both pitches to the drone or memory of the drone, rather than to each other).

- Diminished fourths (~41 cents larger than pure major thirds): A to D♭, E to A♭, B to E♭, F♯ to B♭
- Augmented seconds (~41 cents smaller than pure minor thirds\(^5\)): A♭ to B, E♭ to F♯, D♭ to E
- Diminished thirds: (~20 cents larger than pure major seconds\(^6\)): F♯ to A♭, B to D♭

In order for these dissonant sonorities to be convincing, they must be performed and understood as dissonances – not as resting points, but as sonorities in motion. This is important regardless of the tuning. If tuned in equal temperament, the abovementioned B – E – A♭ sonority of m. 5 sounds exactly like an equal-tempered E major triad; still, its dissonant notation makes clear that it should be understood and interpreted as a dissonance within the larger tonal context.

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\(^5\) By pure minor third, I mean the interval between C and E♭ on the lattice; the ratio 6:5.

\(^6\) By pure major second, I mean the interval between C and D on the lattice; the ratio 9:8.
IIIc. Additional Tuning Tips

• It is helpful to notice that there are two different sizes of half-step in the Theme and Variations. Diatonic half-steps, in which the note name changes, occur from C to B♭, D to B♭, F♯ to G, G to A♭, and B to C. These are larger (about 112 cents). Chromatic half-steps, in which only the accidental changes, occur from B♭ to E, A♭ to A, and B♭ to B. These are smaller (about 71 cents). It is helpful to think of these in the following way: a change of note name means a larger pitch change than a change in accidental.

• There are also two sizes of whole step. The larger whole step (referred to as the major whole-tone, 204 cents) occurs between two pitches of the same row of fifths, and is almost identical to an equal-tempered whole step. The rarer smaller whole step (the minor whole-tone, 182 cents) occurs between two pitches on two different rows of fifths. There are four of these: B♭ to F, B♭ to C, G to A, and D to E.

• The use of open strings and harmonics is encouraged in general, and especially when this makes it easier to find pitches.

• It is possible to play this piece by tuning in equal temperament and adjusting from there. This strategy has the advantage of familiarity, and avoids the dissonant interval between the D and A strings which results from the tuning given above. The disadvantage is that the open A and E strings and their harmonics will be slightly sharp with respect to the pitches of the lattice. Thus either these open strings and harmonics will need to be avoided (especially in slow or exposed passages) or the tuning will need to be compromised.

IV. Additional Resources

Please email sedgwick@post.harvard.edu for the following additional materials:

• Parts
• Synthesized realizations of the Theme and Variations in both just intonation and equal temperament (including under-tempo versions)

7 There are half-steps of other sizes available on the lattice: D♭ to D and F to F♯ (both 92 cents) and A to B♭ (133 cents). These half-steps are almost entirely avoided in the Theme and Variations.
Score

Theme and Variations
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THEME
Warm, gentle, patient $j = 28$ with vocal legato and portamento

Violin 1
Violin 2
Viola
Cello
VARIATION 1

• • = 112 Playful, with excitement
hold back on the downbeat
VARIATION 2

Gently and gracefully rhythmic. Rests should be rhythmic too:

\[ \frac{j = 112}{\text{as much as possible, deaden pizzicati and end bowed notes right on the beat.}} \]
VARIATION 3

Pure and transparent. Use separate bows throughout – dotted slurs indicate phrase shapes.
VARIATION 4

$\text{} = 28$ Fervent, use vibrato to intensify dynamics

Steady patient swell through each note. Use very slow bow, but switch bow quickly at the beginning of each note, rather than rounding off the end of the note — the energy of these measures is in the changes between notes.

Same technique as previous four measures, but reverse envelopes (slow bow and steady dim. through each note, with quick bow changes between notes).
Distant, lucid

With internal confidence

pp very steady cresc.

pp very steady cresc.

pp very steady cresc.
VARIATION 5

\( \text{\textit{d} = 63\ Wacky\ and\ buoyant} \ -> \textit{ascending eighth notes should float (rather than drive) upwards}} \)

\text{\textit{wild vibrato}}
VARIATION 6

• = 72 Warm, flowing in long phrases, with vocal legato and portamento

\[ \text{mp mf (accompaniment)} \]

\[ \text{arco} \]

\[ \text{mp mf (accompaniment)} \]

\[ \text{p–mp (reinforce vc.)} \]

\[ f \text{ (solo; bring out)} \]
VARIATION 7

\( \cdot = 123 \)

Fast, on edge, not in a comfortable groove; all swells non vibrato.

\( \text{f/p marking means play } p \text{ with } f \text{ accents.} \)
VARIATION 8
Plummeting forward: \( \cdot \cdot \cdot = 126 \)
brassy, ugly, non legato
VARIATION 9
Extremely gentle and patient $J = 28$

gradually warmer

poco rit.